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MANUAL

OF THE

NEW ZEALAND MOLLUSCA.

WITH AN ATLAS OF QUARTO PLATES.

BY

HENRY SUTER.

PUBLISHED BY THE AUTHORITY OF THE GOVERNMENT
OF NEW ZEALAND.

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1913.

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PREFACE.

In May, 1873, the New Zealand Government published the late Captain F. W. Hutton's "Catalogue of the Marine Mollusca of New Zealand," which was followed in 1880 by his "Manual of the New Zealand Mollusca." In this latter work 595 species of *Mollusca* are enumerated, of which, however, about 148 species are now known as not belonging to the New Zealand fauna; others have been recognized as synonyms of New Zealand species, and a number are undoubtedly introduced molluscs. This brings the number of New Zealand species of *Mollusca* in the Manual down to about 447, whereas in the present Manual 1,079 species are dealt with, to which 108 subspecies and varieties are to be added, making a total of 1,187 distinct forms. This shows that during the last thirty-three years a considerable number of species have been added to our fauna, the descriptions of the species being published in the "Transactions of the New Zealand Institute," the "Proceedings of the Malacological Society of London," the "Journal of Malacology," the "Journal de Conchyliologie," and a number of other scientific periodicals. It was therefore no easy matter for a student of New Zealand conchology to get together all the literature on the subject, and the necessity of a new Manual was advocated by all those interested in conchology and palæontology. Hutton's Manual of 1880 has one great drawback—the want of illustrations, which deprives it to a considerable extent of its value, especially for those who want to take up conchology as a hobby.

Having devoted much of my time to collecting and studying the New Zealand *Mollusca* since my arrival in 1887, I was prepared to undertake the work of writing a new "Manual of the New Zealand Mollusca" if the Government would kindly give me the necessary assistance.

In January, 1906, I laid the matter before the New Zealand Institute, when the very gratifying resolution was passed requesting the Government to consider favourably the desirability of issuing a new "Manual of the New Zealand Mollusca." At the meeting in January, 1907, the late Sir James Hector, as President of the New Zealand Institute, stated that the Government had decided to publish a work on the subject, and had appointed me as editor. At my special request, the Government allowed the text of the Manual to be accompanied by an atlas of plates.

I wish here to express my very best thanks to the Hon. George Fowlds, then Minister of Education; Mr. Alfred Kidd, then Member of Parliament; Mr. G. Hogben, Inspector-General of Schools; Messrs. M. H. Browne and W. E. Spencer, of the Education Department. Beginning my work in January, 1907, they all most kindly assisted me in my task.

What Sir James Hector expressed in the preface to the Manual of 1880 should be repeated here: "Shells afford the most reliable data for palæontologists; but before the extinct shell fauna can be utilized the Recent shells of the area must be thoroughly determined."

The classification adopted in this Manual is that of Dr. Paul Pelseneer in the "Treatise on Zoology," part v, Mollusca, edited by E. Ray Lankester, 1906, with the exception that the *Pteropoda* are treated as a class, according to the investigations of P. Schiemenz. The Pteropods undoubtedly already appear in the Palæozoic, and not first in the Mesozoic as Pelseneer's theory would have it. We therefore must conclude that the Gastropods were derived from Pteropods, and not from Opisthobranchs. The anatomical details of the higher groups are, to a large extent, copied from Pelseneer's excellent book.

The Manual deals with the *Mollusca* of the North and South Islands of New Zealand, Stewart Island, the Chatham Islands, and the subantarctic islands of New Zealand, including Macquarie Island, but not with those of the Kermadec Islands, which belong to a distinct province of the Australian subregion. Mr. Tom Iredale, who was a member of the scientific exploring expedition to the Kermadecs in 1908, has already published a

preliminary part of the report on the *Mollusca* in the Proc. Mal. Soc., and further contributions may be forthcoming in the near future.

Of the 322 genera recorded, the following twenty-one are precinctive to New Zealand: *Eudoxochiton, Incisura, Realia, Neojaneus, Atagema, Latia, Otoconcha, Gerontia, Thermia, Scrpho, Therasia, Phenacohelix, Suteria, Ranfurlya, Schizoglossa, Athoracophorus, Perrierina, Verticipronus, Pachykellya, Resania,* and *Pinnoctopus.* Whether *Phenacohelix* is identical with *Rhytidopsis,* Ancey, from New Caledonia, is still uncertain, as the animal of the latter has not been examined. As far as shell-characters go, there is very little difference between the two. *Otoconcha* is no doubt very nearly allied to *Vitrinopsis,* Semper, of the Philippine Islands: externally the animals are similar, and the differences in the jaw, radula, and reproductive organs are very slight. The Tasmanian land-shells I classed in 1893 under *Gerontia* ("The Nautilus," vol. vii, p. 89) I now consider to belong to a new genus, most likely allied to *Trachycystis* of South Africa.

Of the 322 genera, thirty-seven are precinctive to Australasia (Australia, Tasmania, New Zealand), and of the 1,079 species about 140 occur also in Tasmania and Australia, whereas about sixty species have a more or less wide distribution. The following *Pelecypoda* are found in European and New Zealand seas: *Arca reticulata, Mytilus edulis, Lima lima, Cardita calyculata, Venericardia corbis, Thyasira flexuosa, Kellia suborbicularis, Lasæa miliaris,* and *Corbula gibba.* According to Sir Charles Eliot's publication, the New Zealand Nudibranchs are composed of three elements—1. Tropical: *Chromodoris, Doriopsis.* 2. Forms characteristic of colder seas: *Doris, Acanthodoris, Goniodoris, Rostanga.* 3. Peculiar to Australasia: *Alloiodoris* and *Atagema.*

The following of our marine species have a wide austral distribution: *Nacella fuegiensis* — Tierra del Fuego, Falkland, Kerguelen; *Monodonta nigerrima*—west coast of South America; *Argobuccinum argus* — St. Paul and Amsterdam Islands, South Africa, Tristan da Cunha, and Chile; *Siphonaria lateralis* — Kerguelen, Falkland, Magellan, and Patagonia; *Mytilus edulis* and *M. magellanicus* are circumaustral; *Modiolarca pusilla* — Tierra del Fuego; *M. trapezina* — Patagonia, Tierra del Fuego,

Falkland, South Georgia, Kerguelen, and Marion Islands; *Chione Stutchburyi*—Kerguelen; *C. mesodesma*—Tristan da Cunha.

Of the non-marine *Mollusca*, *Potamopyrgus* has a remarkable distribution, extending from Australasia to tropical America and west Africa, whilst *Melanopsis* occurs in New Zealand, New Caledonia, Spain, north Africa, and Asia Minor. The Australasian genus *Gundlachia* occurs also in North America and on the Antilles. Curiously enough, *Succinea* has never been recorded from New Zealand, the *S. tomentosa*, Pfeiffer, being a *Limnæa*. In the collection of shells left by the late Mr. Traill there were a few specimens of a *Succinea* which, I believe, were found in New Zealand. I sent a specimen to Mr. Edgar A. Smith, of the British Museum, and he informed me that it was unlike any form known to him. Not being quite certain whether Traill's specimens were really collected in New Zealand, I refrained from describing them. Of the *Phenacohelicidæ*, the genera *Phacussa*, *Thalassohelix*, *Allodiscus*, and *Flammulina* are also found in Tasmania, the second and third also in Australia, and some nearly allied forms occur on Lord Howe Island and in New Caledonia. *Flammulina* has spread to Lord Howe, Norfolk, and the Caroline Islands; it is most likely an antarctic genus, being allied to *Amphidoxa* and *Stephanoda* of South America, and, less so, to *Trachycystis* of South Africa. The Australasian-Polynesian genus *Endodonta* has quite recently been discovered in Natal; *Afrodonta*, Melvill and Ponsonby, is very near the subgenera *Thaumatodon* and *Ptychodon;* and undoubted species of *Charopa* have also been found, the animal and the dentition having been examined by the writer. The subgenus *Helenoconcha* from St. Helena I take to be nearly allied to the New Zealand subgenus *Ptychodon*. The subgenus *Phrixgnathus* of the genus *Laoma* occurs also in Tasmania and Australia. The fresh-water genus *Diplodon*, generally known under the name of *Unio*, is widely distributed in South America, New Zealand, the northern rivers of Tasmania, Australia, and one species is recorded from the Congo River, Africa. Highly interesting from the geographic standpoint is the discovery of *Struthiolaria papulosa* at the Seychelles; and the occurrence of *Cryptoplax striatus*, Lam., a *Chiton* found from Torres Strait to Tasmania (but not in New Zealand), at Zanzibar, Khor. Dongola, and Natal.

The principal contributors to our knowledge of the New Zealand *Mollusca* are the following:—

Sir Joseph Banks and Dr. Solander, on the first voyage of Captain James Cook, 1769–70, collected in the Bay of Islands and Queen Charlotte Sound.

Dr. Reinhold and George Forster, on Cook's second voyage, 1773–74, visited Dusky Bay and Queen Charlotte Sound. On Cook's third voyage there was only a short stay of thirteen days' duration in Queen Charlotte Sound.

The shells collected during these voyages, numbering about forty species from New Zealand, were enumerated, and some of them described and figured by von Zorn in the German periodical "Neue Sammlung von Versuchen und Abhandlungen der Naturforschenden Gesellschaft in Danzig," 1778; by J. H. Chemnitz in the journal "Der Naturforscher," 1783, and afterwards in different parts of his "Conchylien Cabinet," especially vol. v (1781), vol. x (1788), and vol. xi (1799); by Dr. Solander himself in the "Catalogue of the Portland Museum," 1786; by Thomas Martyn in the "Universal Conchologist," 1784; and by Perry, "Conchology," 1811. A critical review of the species described by the said authors, and referable to Cook's voyages, has been published by Dr. E. von Martens in the German malacological journal, "Malakozoologische Blätter," vol. xix, 1872.

R. P. Lesson accompanied Duperry on the ship "Coquille" on the voyage round the world, 1822–25, and collected molluscs at the Bay of Islands in April, 1824. A number of species were described in the "Voyage autour du Monde sur la 'Coquille,' Zoologie," 2 vols., published from 1826 to 1832.

The most valuable contributions to New Zealand conchology in the early days were made by Quoy and Gaimard, naturalists of Dumont d'Urville's "Voyage autour du Monde de 'l'Astrolabe,' 1826–29, Zoologie," vol. ii, 1832–33; vol. iii, 1834–35; with atlas in folio containing beautiful illustrations. They collected molluscs in Queen Charlotte Sound, at the Thames, and some outlying islands.

The Rev. W. Yate sent a collection of shells from the east coast of New Zealand to the British Museum in 1835, and the twenty-nine species were catalogued by Dr. J. E. Gray in an

appendix to Yate's "Account of New Zealand," 1835, and descriptions of ten new species were given.

The New Zealand molluscs collected during the United States Exploring Expedition, commanded by Charles Wilkes, 1838–42, were obtained at the Bay of Islands, Akaroa, and the Auckland Islands. J. P. COUTHOUY was conchologist of the expedition, but was prevented through ill health from making notes after arrival at Samoa. AUGUSTUS A. GOULD described the molluscs in the "Proceedings of the Boston Society of Natural History," 1846–50; also, as a separate volume, "Expedition Shells," 1846. Later they have been more fully described, and also figured, in the official work, "United States Exploring Expedition," vol. xii, Mollusca and Shells, 1852, with an atlas of plates in folio.

The "Venus," under command of A. DU PETIT-THOUARS, paid a visit to the Bay of Islands in October, 1838; but few shells were collected.

In 1840 Dr. E. DIEFFENBACH visited the North Island of New Zealand and the Chatham Islands, and brought back with him fifty-eight species of shells, which were enumerated and the new species described by Dr. J. E. GRAY in the appendix to Dieffenbach's "Travels in New Zealand," vol. ii, 1843.

The French ships "Astrolabe" and "Zélée" visited in 1841 the Bay of Islands, Akaroa, Port Chalmers, and the Auckland Islands. The records on the *Mollusca* of this voyage, extending over the period 1837–41, called "Voyage au Pôle Sud," vol. v, 1854, were written by HOMBRON and JACQUINOT, and accompanied by fine illustrations.

In the same year (1841) H.M.S. "Erebus" and "Terror," under the command of Sir James Ross, visited Campbell Island, the Auckland Islands, and the Bay of Islands. The *Mollusca* of the expedition were not published until June, 1874, by EDGAR A. SMITH, of the British Museum, the publication containing also illustrations of type specimens not figured before.

In 1842 Dr. STANGER sent to the British Museum shells which had been collected in New Zealand by Dr. SINCLAIR.

During the years 1847–49 H.M.S. "Acheron" was engaged surveying the coast of the islands, and in 1849 the conchologist FREDERICK STRANGE visited New Zealand in her, touching at

Auckland, Wellington, and the Canterbury Settlement. He no doubt dredged in New Zealand waters, as he had already done so in the vicinity of Sydney. His collection of shells was evidently purchased by Hugh Cuming, and supplied material for several papers in the Proc. Zool. Soc. for the next few years by A. Adams and G. P. Deshayes.

Dr. Greenwood also collected shells in New Zealand, which he sent to the British Museum. These were partly described by Dr. J. E. Gray in the Proc. Zool. Soc., 1849, and by Dr. L. Pfeiffer in the Malak. Blätter.

In 1859 the Austrian frigate "Novara" visited Auckland. F. von Hochstetter, G. von Frauenfeld, and J. Zelebor were members of the expedition. Some land and fresh-water shells collected by the first-named during his stay in New Zealand were described by Dr. L. Pfeiffer and Professor W. Dunker in the Malak. Blätter. vol. viii, 1861; concerning those collected by the other two scientists, only the apparent new ones have been described by Dunker and Zelebor in the Verhandl. Zool.-bot. Gesellsch. Wien, 1866, and then, with figures, by Frauenfeld in the official work, "Reise der oesterreichischen Fregatte 'Novara' um die Erde," 1857–59, Zoologischer Theil, vol. ii, 1867. He later on published a list in Verhandl. Zool.-bot. Gesellsch. Wien, vol. xix, 1869, of all species of *Mollusca* collected during the expedition, many of which, however, are wrongly assigned to New Zealand.

H.M.S. "Challenger" visited New Zealand in June and July, 1874, and the *Mollusca* obtained—mostly deep-sea forms—were described in the "'Challenger' Reports." Vol. x contains the *Nudibranchiata*, by Dr. R. Bergh: vol. xiii the *Lamellibranchiata*, by Edgar A. Smith: vol. xv the *Marseniadæ*, by Dr. R. Bergh; *Scaphopoda* and *Gastropoda*, by the Rev. R. Boog Watson; *Polyplacophora*, by A. C. Haddon: vol. xvi the *Cephalopoda*, by Dr. W. E. Hoyle: and vol. xxiii the *Pteropoda* by Dr. P. Pelseneer. A few land-shells were described and figured by Edgar A. Smith in the Proc. Zool. Soc., 1884.

In the same year (1874) Dr. H. Filhol collected on Campbell Island, and subsequently in several parts of New Zealand. The results were published in the "Comptes Rendus," and later (1885) in a volume called "Mission scientifique à l'île Campbell."

At the same time Dr. KRONE collected some land-shells on the Auckland Islands.

The antarctic expedition under C. E. Borchgrevink, in the "Southern Cross," brought one new species from Campbell Island and three from the Auckland Islands. They were described and figured by EDGAR A. SMITH in the "Report on the Collections of Natural History made in the Antarctic Regions during the Voyage of the 'Southern Cross,'" 1902, vii, Mollusca.

With the "Catalogue of Marine Mollusca of New Zealand," 1873, Captain F. W. HUTTON laid the foundation of a large amount of work which he afterwards did, including his "Manual of the New Zealand Mollusca." Captain Hutton greatly advanced the knowledge of our *Mollusca* not only by systematic work, but also by his numerous anatomical researches. He was at all times ready with his advice and assistance to other workers in science, and ever since arriving in New Zealand the writer of these lines was fortunate enough to enjoy the benefit of Captain Hutton's wide knowledge, and it was greatly due to his stimulus and help that the study of the marine *Mollusca* was taken up.

Mr. T. F. CHEESEMAN did extensive collecting and dredging in Auckland Harbour. He published in the Trans. N.Z. Inst. lists of the *Mollusca* of the Auckland Harbour and of the vicinity of Auckland, followed by papers on new nudibranchiate and opisthobranchiate *Mollusca*.

Of recent collectors, special mention should be made of Captain J. BOLLONS, of the Government steamer "Hinemoa." For a number of years he has been collecting and dredging in many parts of New Zealand and its subantarctic islands, and has thus materially helped to increase the number of species, and to enlarge our knowledge of geographical distribution.

Mr. A. HAMILTON, Director of the Dominion Museum, has also done very much to further New Zealand conchology by collecting in many parts of the Dominion, and also on Macquarie Island.

Mr. CHARLES COOPER, of Auckland, has collected *Mollusca* in the vicinity of Auckland and the northern parts of New Zealand for many years, and has published in the Trans. N.Z. Inst., vol. xxxi, a useful list of the marine shells found at Whangarei Heads.

Mr. R. Murdoch, of Wanganui, devoted much time to collecting and dissecting non-marine as well as marine *Mollusca*, and has published a number of valuable papers in the Trans. N.Z. Inst., and the Proc. Mal. Soc. It is much to be regretted that he has been unable to continue his good work during a number of years.

Mr. Justice Gillies, in 1881, took Dr. Sinclair's collection of New Zealand shells to the British Museum, and had them named by Messrs. G. B. Sowerby, Jun., and Edgar A. Smith. The result was published in the Trans. N.Z. Inst., vol. xiv.

Mr. James Adams published a valuable list of the land and fresh-water *Mollusca* of the Thames Goldfields in the Trans. N.Z. Inst., vol. xix.

Amongst those who helped to advance our conchological knowledge the following should be mentioned: Dr. W. B. Benham, Major T. Broun, Dr. Charles Chilton, Messrs. R. Helms, Richard Henry, Miss M. Mestayer, Messrs. Shand, W. W. Smith, C. Spencer, C. Traill, and W. H. Webster, some of whom published papers on New Zealand *Mollusca*.

Mr. T. W. Kirk also did some collecting, and published a few short papers on *Mollusca*; especially valuable are his communications on the large cuttlefishes.

Dr. Schauinsland visited New Zealand and the Chatham Islands in 1896–97, and Dr. Thilenius from 1897 to 1899, partly for the purpose of collecting specimens for the museums in Bremen and Berlin. Reports on the *Mollusca* were published by Dr. R. Bergh, Dr. L. H. Plate, and Dr. Kurt Wissel.

During the year 1902 Messrs. K. Lucas and G. L. Hodgkin, of Cambridge, made a collection of the fauna of a typical series of lakes in New Zealand, most of the *Mollusca* being obtained by dredging. They were kindly handed over to me for description, and the result was published in the Trans. N.Z. Inst., vol. xxxvii.

In January, 1904, a party organized by Mr. Charles Hedley, Conchologist of the Australian Museum, Sydney, dredged in 110 fathoms east of Great Barrier Island, with good results. The shells obtained were worked out by Messrs. C. Hedley, W. H. Webster, R. Murdoch, and myself, and the results published in the Trans. N.Z. Inst., vol. xxxviii.

Mr. T. Iredale did a good deal of collecting during some time, and he published lists of the *Mollusca* found at Titahi Bay, Banks Peninsula, and Otago. He also described a few new species, unfortunately without figures, and up to the present day he has failed to present the types to the Canterbury Museum, as promised in his publication.

In vols. xliii and xliv of the Trans. N.Z. Inst. there are two excellent papers on the anatomy of *Siphonaria obliquata* by Mr. A. J. Cottrell, of Auckland.

I wish to express my grateful thanks to all those who kindly assisted me in my work, either by giving me useful advice and information or assisting me with material — viz., Captain J. Bollons; Dr. W. H. Dall, U.S. Nat. Museum, Washington; Sir Charles Eliot, Sheffield; Messrs. J. H. Gatliff, Melbourne; A. Hamilton, Wellington; Charles Hedley, Assistant Curator of the Australian Museum, Sydney; W. L. May, Sandford, Tasmania; Miss M. Mestayer, Wellington; Mr. J. H. Ponsonby, London; Professor Dr. H. R. Simroth, Leipzig; Mr. Edgar A. Smith, I.S.O., British Museum (Nat. Hist.), London; Dr. H. Strebel, Hamburg; Dr. J. Thiele, K. Zoologisches Museum, Berlin; Dr. J. C. Verco, Adelaide.

Finally, I have to express my obligations to the Government Printer and to the Supervisor of the Government Printing Office for the great care they have taken in passing the work through the press, and to Mr. A. Hamilton for his kind help in the production of the plates of the atlas.

Henry Suter.

Christchurch, September, 1913.

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ERRATA.

Page 12, line 12 from top.—*For* "Arctic" *read* "Antarctic."

,, 18, line 20 from bottom.—*For* "Plate 2" *read* "Plate 3."

,, 18, line 21 from bottom.—*For* "Plate 3" *read* "Plate 2."

,, 85, line 1 from top.—*Add* "Plate 33, figs. 1, 1*a*."

,, 93, line 26 from bottom.—*For* "323" *read* "322."

,, 95, line 21 from bottom.—*For* "323" *read* "322."

,, 108, *Trochus oppressus*.—There is no fig. 2*a*.

,, 127, *Cantharidus rufozona*.—*For* "Plate 35, fig. 16," *read* "Plate 39, fig. 21."

,, 287, *Crepidula costata*.—There is no fig. 6*a*.

,, 289, *Natica zelandica*.—There is no fig. 7*a*.

,, 302, line 15 from bottom.—*Omit* "no sutural channel."

,, 302, line 18 from bottom.—*Omit*, "(*a*.) Aperture without a channel at the suture."

,, 361, line 6 from top.—*Add* "Cape Maria van Diemen."

,, 404.—To end of Trophon *add* "*Vernacular Name*.—Whelk."

,, 411, line 22 from top.—*After* "subapical" *add* "(Plate 19, fig. 4.)"

,, 417, after line 22 from bottom.—*Add* "*Remark*.—I have not seen this species."

,, 478, line 1 from top.—*For* "fig. 7" *read* "fig. 9."

,, 482, line 15 from top.—*For* "fig. 9" *read* "fig. 7."

,, 494, line 11 from bottom.—*For* "deep" *read* "shallow."

,, 581, line 14 from bottom.—*For* "Æolidiella" *read* "1. Æolidiella."

,, 604, line 10 from top.—*For* "Limnoëa" *read* "Lymnoëa."

,, 720, line 4 from top.—*After* "(A. Hamilton)" *add* "; Bealey."

,, 784, line 1 from top.—*For* "Canterbury Museum, Christchurch," *read* "collection of Dr. Gaze, Westport."

,, 827, line 13 from top.—*After* "breadth" *add* "or height."

,, 891, line 4 from bottom.—*Add* "Chatham Islands."

,, 891, line 2 from bottom.—*For* "September" *read* "October."

,, 899, line 6 from top.—*Add* "*C. Trailli*, Hutton, C. Tert. M., 24."

,, 942, line 10 from top.—*For* "Dominion Museum, Wellington," *read* "Canterbury Museum, Christchurch."

Note.—By an unfortunate oversight the greater part of the proofs were not sent to the author for final revision, hence the long list of corrections and additions.

LIST OF ABBREVIATIONS.

A.M.N.H. ..	Annals and Magazine of Natural History.
A.s.V.	Histoire Naturelle des Animaux sans Vertèbres.
Ad., G.R.M. ..	H. and A. Adams: The Genera of Recent Mollusca.
C.M.M.	F. W. Hutton: Catalogue of Marine Mollusca of New Zealand. 1873.
C. Tert. M. ..	F. W. Hutton: Catalogue of the Tertiary Mollusca of New Zealand. 1873.
C. Tert. M.B.M. ..	G. F. Harris, Catalogue of the Tertiary Mollusca in the British Museum. Part i, the Australasian Tertiary Mollusca. 1897.
Cat. A.M. ..	Catalogue of the Australian Museum, Sydney.
Chall. Rep. ..	Report of the Scientific Results of the Voyage of H.M.S. "Challenger" during the years 1873–76. Zoology.
Conch. Cab. ..	J. H. Chemnitz, Neues Systematisches Conchylien Cabinet. 1769–95.
Conch. Icon. ..	L. Reeve: Conchologia Iconica, 1843–78; completed by Sowerby.
Crit. List ..	E. von Martens: Critical List of the Mollusca of New Zealand contained in European Collections. 1873.
Dieff. N.Z. ..	E. Dieffenbach: Travels in New Zealand, vol. ii. 1843.
Ereb. & Ter. ..	Edgar A. Smith: Mollusca—The Zoology of the Voyage of H.M.S. "Erebus" and "Terror." 1874.
Ess. Pal. Comp. ..	M. Cossmann: Essais de Paléoconchologie Comparée, depuis 1895.
Index	F. W. Hutton: Index Faunæ Novæ Zealandiæ. 1904.
J. de Conch. ..	Journal de Conchyliologie. Paris.
J.L.S.	Journal of the Linnean Society, London. Zoology.
J. Mal.	Journal of Malacology; edited by W. E. Collinge.
M.H. Viv. ..	L. Pfeiffer: Monographia Heliceorum viventium. 4 vols. 1848–58.
M.N.Z.M. ..	F. W. Hutton: Manual of the New Zealand Mollusca. 1880.
Mal. Bl. ..	Malakozoologische Blätter.
Man. Conch. ..	Tryon and Pilsbry: Manual of Conchology.
Mem. A.M. ..	Memoirs of the Australian Museum, Sydney.
Miss. I.C. ..	Filhol: Mission scientifique à l'île Campbell. 1885.

Mus. Bolten. ..	J. F. Bolten : Museum Boltenianum. 1798.
N.D.M.G. ..	Nachrichtsblatt der deutschen Malakozoologischen Gesellschaft.
N.Z.J.S. ..	New Zealand Journal of Science.
Nomencl. Hel. Viv.	Pfeiffer—Clessin : Nomenclator Heliceorum viventium. 1878.
P. Bost. S.N.H. ..	Proceedings of the Boston Society of Natural History.
P.L.S. N.S.W. ..	Proceedings of the Linnean Society of New South Wales
P. Mal. S. ..	Proceedings of the Malacological Society of London.
P.R.S. Tas. ..	Proceedings of the Royal Society of Tasmania.
P.R.S. Vic. ..	Proceedings of the Royal Society of Victoria.
P.Z.S.	Proceedings of the Zoological Society of London.
Plioc. M. ..	F. W. Hutton : The Pliocene Mollusca of New Zealand, in the Macleay Memorial Volume. 1893.
Q.J.M.S. ..	Quarterly Journal of the Microscopical Society of London.
Rec. A.M. ..	Records of the Australian Museum, Sydney.
Subantarct. Islds. N.Zeal.	The Subantarctic Islands of New Zealand ; edited by C. Chilton, D.Sc. 2 vols. 1909.
Syst. Nat. ..	Linné : Systema Naturæ. Ed. 10. 1758.
T.N.Z.I... ..	Transactions of the New Zealand Institute.
T.R.S. S.Aust. ..	Transactions of the Royal Society of South Australia.
Thes. Conch. ..	Sowerby : Thesaurus Conchyliorum. 11 vols. 1843–79.
U.S. Expl. Exp. ..	Augustus A. Gould : Mollusca and Shells of the United States Exploring Expedition, 1838–42. 1 vol. and atlas. 1852.
Un. Conch. ..	Thomas Martyn : The Universal Conchologist.
V.Z.B.G. Wien ..	Verhandlungen der Zoologisch-botanischen Gesellschaft in Wien.
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SYNOPSIS OF THE GENERA.

Phylum **MOLLUSCA.**

Class I. AMPHINEURA.

Ord. 1. POLYPLACOPHORA.

Subord. 1. EOPLACOPHORA.

Fam. *Lepidopleuridæ*.—Lepidopleurus.

Subord. 2. MESOPLACOPHORA.

Fam. *Ischnochitonidæ*.—Ischnochiton, Callochiton.
Fam. *Mopaliidæ*.—Mopalia, Plaxiphora.
Fam. *Acanthochitidæ*.—Acanthochites, Spongiochiton.

Subord. 3. TELEOPLACOPHORA.

Fam. *Chitonidæ*.—Chiton, Eudoxochiton, Tonicia, Acanthopleura, Lorica, Onithochiton.

Class II. PTEROPODA.

Ord. 1. THECOSOMATA.

Fam. *Cymbuliidæ*.—Cymbulia.
Fam. *Cavoliniidæ*.—Cavolina, Cuvierina.
Fam. *Limacinidæ*.—Limacina.

Class III. GASTROPODA.

Subclass I. STREPTONEURA.

Ord. 1. ASPIDOBRANCHIA.

Subord. 1. DOCOGLOSSA.

Fam. *Acmæidæ*.—Acmæa.
Fam. *Patellidæ*.—Nacella, Helcioniscus.

Subord. 2. RHIPIDOGLOSSA.

Fam. *Scissurellidæ*.—Scissurella, Schismope.
Fam. *Haliotidæ*.—Haliotis.
Fam. *Fissurellidæ*.—Fissurella, Incisura, Emarginula, Subemarginula, Scutus, Puncturella, Fissuridea.
Fam. *Trochidæ*.—Trochus, Monodonta, Cantharidus, Photinula, Gibbula, Fossarina, Monilea, Calliostoma, Euchelus.
Fam. *Liotiidæ*.—Liotia.
Fam. *Cyclostrematidæ*.—Cyclostrema, Delphinoidea, Cirsonella, Pseudoliotia.
Fam. *Vitrinellidæ*.—Lissospira, Circulus, Cyclostremella.
Fam. *Turbinidæ*.—Turbo, Leptothyra, Astræa.
Fam. *Phasianellidæ*.—Phasianella.
Fam. *Umboniidæ*.—Ethalia.
Fam. *Neritidæ*.—Nerita.
Fam. *Cocculinidæ*.—Cocculina.
Fam. *Hydrocenidæ*.—Hydrocena.

Ord. 2. PECTINIBRANCHIA.

Subord. 1. TÆNIOGLOSSA.

Tribe 1. Platypoda.

Fam. *Cyclophoridæ*.—Lagochilus.
Fam. *Diplommatinidæ*.—Palaina, Gastroptychia.
Fam. *Litorinidæ*.—Litorina, Lævilitorina.
Fam. *Risellidæ*.—Risellopsis.
Fam. *Fossaridæ*.—Couthouyia.
Fam. *Planaxidæ*.—Planaxis.
Fam. *Realiidæ*.—Realia, Omphalotropis.
Fam. *Rissoidæ*.—Rissoa, Amphithalamus, Anabathron, Rissoina, Skenella.
Fam. *Litiopidæ*.—Diala.
Fam. *Omalogyridæ*.—Omalogyra.
Fam. *Hydrobiidæ*.—Potamopyrgus.
Fam. *Thiaridæ*.—Melanopsis.
Fam. *Cerithiidæ*.—Cerithidea, Bittium.
Fam. *Cerithiopsidæ*.—Cerithiopsis, Newtoniella, Seila.
Fam. *Triforidæ*.—Triphora.
Fam. *Vermetidæ*.—Serpulorbis, Siphonium, Stephopoma, Siliquaria.
Fam. *Cæcidæ*.—Cæcum.
Fam. *Turritellidæ*.—Turritella.
Fam. *Mathildiidæ*.—Mathilda.
Fam. *Struthiolariidæ*.—Struthiolaria.
Fam. *Xenophoridæ*.—Xenophora.
Fam. *Capulidæ*.—Capulus, Neojanacus.

Fam. *Hipponicidæ*.—Hipponix.
Fam. *Calyptræidæ*.—Calyptræa, Crepidula.
Fam. *Naticidæ*.—Natica, Polinices, Ampullina.
Fam. *Lamellariidæ*.—Lamellaria.
Fam. *Trichotropidæ*.—Trichotropis, Lippistes.
Fam. *Janthinidæ*.—Janthina.
Fam. *Cypræidæ*.—Trivia.
Fam. *Septidæ*.—Septa, Cymatium, Argobuccinum.
Fam. *Cassididæ*.—Phalium.
Fam. *Tonnidæ* —Tonna.
Fam. *Architectonicidæ*.—Architectonica, Heliacus, Omalaxis.
Fam. *Epitoniidæ*.—Epitonium, Crossea, Aclis.

Aglossa.

Fam. *Pyramidellidæ*.—Pyramidella, Turbonilla, Odostomia.
Fam. *Eulimidæ*.—Eulima.

Tribe 2. Heteropoda.

Fam. *Atlantidæ*.—Atlanta.
Fam. *Carinariidæ*.—Carinaria.
Fam. *Pterotracheidæ*.—Pterotrachea.

Subord. 2. STENOGLOSSA.

Tribe 1. Rachiglossa.

Fam. *Turbinellidæ*.—Megalatractus.
Fam. *Fasciolariidæ*.—Fusinus, Latirus.
Fam. *Mitridæ*.—Mitra, Vexillum.
Fam. *Chrysodomidæ*.—Siphonalia, Euthria.
Fam. *Buccinidæ*.—Cominella, Phos, Pisania, Cantharus.
Fam. *Alectrionidæ*.—Alectrion.
Fam. *Muricidæ*.—Murex, Trophon, Typhis.
Fam. *Thaisidæ*.—Thais, Drupa.
Fam. *Cancellariidæ*.—Admete.
Fam. *Pyrenidæ*.—Mitrella, Anachis, Alcira, Atilia.
Fam. *Volutidæ*.—Fulguraria.
Fam. *Olividæ*.—Ancilla.
Fam. *Marginellidæ*.—Marginella, Cryptospira.

Tribe 2. Toxoglossa.

Fam. *Turritidæ*.—Turris, Drillia, Spirotropis, Bela, Surcula, Mitromorpha, Bathytoma, Mangilia, Daphnella.
Fam. *Terebridæ*.—Terebra.

Subclass II. EUTHYNEURA.

Ord. 1. OPISTHOBRANCHIA.

Subord. 1. TECTIBRANCHIA.

Tribe 1. Bullomorpha.

Fam. *Acteonidæ*.—Acteon, Pupa, Leucotina, Bullina.
Fam. *Ringiculidæ*.—Ringicula.
Fam. *Tornatinidæ*.—Tornatina, Volvulella.
Fam. *Scaphandridæ*.—Cylichnella.
Fam. *Bullariidæ*.—Bullaria.
Fam. *Aceridæ*.—Acera, Haminea.
Fam. *Philinidæ*.—Philine.
Fam. *Aglajidæ*.—Aglaja.

Tribe 2. Aplysiomorpha.

Fam. *Aplysiidæ*.—Tethys, Notarchus.

Tribe 3. Pleurobranchomorpha.

Fam. *Umbraculidæ*.—Umbraculum.
Fam. *Pleurobranchidæ*.—Pleurobranchus, Pleurobranchæa.

Subord. NUDIBRANCHIA.

Tribe 1. Tritoniomorpha.

Fam. *Tritoniidæ*.—Tritonia.

Tribe 2. Doridomorpha.

Fam. *Goniodorididæ*.—Goniodoris, Acanthodoris.
Fam. *Doridida*.—Doris, Rostanga, Alloiodoris, Gargamella, Atagema, Chromodoris, Aphelodoris.
Fam. *Doriopsidæ*.—Doriopsis, Doriopsilla.

Tribe 3. Eolidomorpha.

Fam. *Eolididæ*.—Eolis, Æolidiella, Facelina, Eolidia, Hervia.
Fam. *Proctonotidæ*.—Antiopella.
Fam. *Fionidæ*.—Fiona.

Tribe 4. Elysiomorpha.

Fam. *Hermæidæ*.—Stiliger.

Ord. 2. PULMONATA.

Subord. 1. BASOMMATOPHORA.

Fam. *Auriculidæ*.—Ophicardelus, Marinula, Leuconia, Cremnobates.
Fam. *Amphibolidæ*.—Amphibola.
Fam. *Siphonariidæ*.—Siphonaria.
Fam. *Gadinidæ*.—Gadinia.
Fam. *Lymnæidæ*.—Lymnoëa, Amphipeplea.
Fam. *Planorbidæ*.—Planorbis, Isidora.
Fam. *Ancylidæ*.—Latia, Gundlachia.

Subord. 2. STYLOMMATOPHORA.

Tribe 1. Holognatha.

Fam. *Zonitidæ*.—Fretum.
Fam. *Limacidæ*.—Otoconcha.
Fam. *Phenacohelicidæ*.—Phacussa, Thalassohelix, Gerontia, Allodiscus, Thermia, Serpho, Therasia, Phenacohelix, Suteria, Flammulina, Ranfurlya.
Fam. *Endodontidæ*.—Endodonta, Laoma.
Fam. *Bulimulidæ*.—Placostylus.
Fam. *Achatinellidæ*.—Tornatellina.

Tribe 2. Agnatha.

Fam. *Rhytididæ*.—Rhytida, Paryphanta, Schizoglossa, Delos.

Tribe 3. Elasmognatha.

Fam. *Athoracophoridæ*.—Athoracophorus.

Tribe 4. Digonopora.

Fam. *Onchidiidæ*.—Onchidella.

Class IV. SCAPHOPODA.

Fam. *Dentaliidæ*.—Dentalium.
Fam. *Siphonodentaliidæ*.—Cadulus.

Class V. PELECYPODA.

Ord. 1. PROTOBRANCHIA.

Fam. *Solemyidæ*.—Solemya.
Fam. *Nuculidæ*.—Nucula.
Fam. *Ledidæ*.—Leda, Malletia, Pleurodon, Poroleda.

Ord. 2. FILIBRANCHIA.

Subord. 1. ANOMIACEA.

Fam. *Anomiidæ*.—Anomia, Placunanomia.

Subord. 2. ARCACEA.

Fam. *Arcidæ*.—Arca, Glycymeris.
Fam. *Limopsidæ*.—Limopsis, Lissarca.
Fam. *Philobryidæ*.—Philobrya, Hochstetteria.

Subord. 3. MYTILACEA.

Fam. *Mytilidæ*.—Mytilus, Modiolus, Modiolaria, Lithophaga, Dacrydium.

Subord. 4. PECTINACEA.

Fam. *Pectinidæ*.—Pecten.

Ord. 3. EULAMELLIBRANCHIA.

Subord. 1. OSTRACEA.

Fam. *Limidæ*.—Lima.
Fam. *Ostreidæ*.—Ostrea.
Fam. *Pinnidæ*.—Atrina.

Subord. 2. SUBMYTILACEA.

Fam. *Modiolarcidæ*.—Modiolarca.
Fam. *Crassatellitidæ*.—Crassatellites, Cyamiomactra. Perrierina, Cuna.
Fam. *Carditidæ*.—Cardita, Venericardia, Verticipronus.
Fam. *Condylocardiidæ*.—Condylocardia.
Fam. *Lucinidæ*.—Loripes, Divaricella, Montacuta.
Fam. *Diplodontidæ*.—Diplodonta.
Fam. *Thyasiridæ*.—Thyasira.
Fam. *Leptonidæ*.—Erycina, Kellia, Neolepton, Lasæa, Myllita, Pachykellya, Rochefortia, Cyamium.
Fam. *Sphæriidæ*.—Sphærium, Corneocyclas.
Fam. *Unionidæ*.—Diplodon.

Subord. 3. TELLINACEA.

Fam. *Tellinidæ*.—Tellina, Macoma.
Fam. *Semelidæ*.—Leptomya.
Fam. *Mesodesmatidæ*.—Mesodesma.
Fam. *Mactridæ*.—Mactra, Spisula, Raëta, Zenatia, Resania.

Subord. 4. VENERACEA.

Fam. *Veneridæ*.—Dosinia, Macrocallista, Cytherea, Chione, Gomphina, Paphia, Venerupis.

Subord. 5. CARDIACEA.

Fam. *Cardiidæ*.—Protocardia.

Subord. 6. MYACEA.

Fam. *Psammobiidæ*.—Psammobia, Soletellina.
Fam. *Corbulidæ*.—Corbula.
Fam. *Saxicavidæ*.—Saxicava, Panopea.

Subord. 7. ADESMACEA.

Fam. *Pholadidæ*.—Pholadidea, Barnea.
Fam. *Teredinidæ*.—Teredo.

Subord. 8. ANATINACEA.

Fam. *Thraciidæ*.—Thracia.
Fam. *Periplomidæ*.—Cochlodesma.
Fam. *Myochamidæ*.—Myodora.
Fam. *Chamostreidæ*.—Chamostrea.
Fam. *Verticordiidæ*.—Verticordia.

Ord. 4. SEPTIBRANCHIA.

Fam. *Cuspidariidæ*.—Cuspidaria.

Class VI. CEPHALOPODA.

Ord. 2. DIBRANCHIA.

Subord. 1. DECAPODA.

Tribe 1. Oigopsida.

Fam. *Spirulidæ*.—Spirula.
Fam. *Architeuthidæ*.—Architeuthus.
Fam. *Ommastrephidæ*.—Ommastrephes.
Fam. *Onychoteuthidæ*.—Onychoteuthis.
Fam. *Histioteuthidæ*.—Calliteuthis.
Fam. *Cranchiidæ*.—Taonidium.

Tribe 2. Myopsida.

Fam. *Sepiidæ*.—Sepia.
Fam. *Sepiolidæ*.—Sepiola.
Fam. *Loliginidæ*.—Sepioteuthis.

Subord. 2. OCTOPODA.

Tribe 2. Trachyglossa.

Fam. *Polypodidæ*.—Polypus, Pinnoctopus.
Fam. *Argonautidæ*.—Tremoctopus, Argonauta.

MOLLUSCA OF NEW ZEALAND.

Phylum **MOLLUSCA**, Cuvier.

The Mollusca are originally bilateral organisms in which signs of primitive segmentation are no longer evident.

They possess a well-developed cœlom (gonad and pericardium), enteron, and hæmocœl, quite distinct from one another.

The alimentary tract exhibits (or has lost) a radular sac in its anterior part.

The nervous system consists of a peri-œsophageal ring, whose supra-œsophageal (or dorsal) moiety is the cerebral commissure, and the infra-œsophageal (or ventral) moiety is the labial commissure. The former gives off chiefly sensorial nerves, the latter nerves to the digestive tract. From their union two nervous cords arise on each side —a dorsal or pallial, and a ventral or pedal; from the former arise the visceral nerves, whose main trunks are frequently joined together under the digestive canal to form the infra-intestinal visceral commissure.

The general body-wall is differentiated into three regions: (1) the antero-dorsal or cephalic, on which are borne most of the special sense-organs, called the head; (2) the postero-dorsal or pallial—the mantle—which forms a projecting fold around the body, and secretes on its external face a calcified cuticle or shell, and on its lower surface develops respiratory organs or ctenidia; (3) the ventral or pedal—the foot—which is the organ of locomotion.

A so-called "veliger," or free trochosphere larva, is nearly always present in embryonic development; its preoral ciliated ring grows out to form a natatory velum, and at its formative pole there is a "preconchylian invagination," or shell-gland.

The Mollusca are divided into six classes, which may be interpreted by the following mostly well-known animals: (1) the mail-shell, or *Chiton;* (2) the free and floating hyaline pteropods, with wing-like lobes as organs of motion; (3) the snail and slug; (4) the tusk-shell, or *Dentalium;* (5) the mussel; (6) the cuttlefish.

Molluscs are essentially aquatic animals, but the most varied modes of existence may occur, even among members of the same class. The majority are inhabitants of the sea; a few live in fresh water; a single order of gastropods and a few isolated members of the same group are adapted to a terrestrial life. They are distributed over the whole surface of the earth, and in all latitudes. Terrestrial forms are found on the highest mountains, some *Stylommatophora* at a height of 15,000 ft.; lacustrine forms are found at a depth of

350 fathoms. The pelagic forms are not only distributed over the surface of the sea, but may descend to a depth of 2,600 fathoms without reaching the bottom. Abyssal molluscs are found in all oceans, extending to a depth of 2,800 fathoms from the surface.

The different classes of molluscs were already differentiated at a remote epoch of the Palæozoic era.

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Class I. **AMPHINEURA**, von Ihering.

(= *Isopleura*, Ray Lankester; *Aculifera*, Hatschek.)

The Amphineura are a group of Mollusca characterized, firstly, by their more or less elongated and quite symmetrical body, with the mouth and the anus situated at its two ends; and, secondly, by their mantle, which is always provided with numerous spicules imbedded in a cuticle. The nervous system consists of 2 lateral and 2 ventral parallel cords, meeting in a cerebral ganglion. Head without tentacles or eyes.

All the Amphineura are marine in habit. They are found in all oceans and at nearly all depths. They existed in very ancient geological ages, for they are already present in the Lower Silurian.

There are two very distinct orders—(1) *Polyplacophora;* (2) *Aplacophora.* None of the latter have been recorded from New Zealand.

Order 1 **POLYPLACOPHORA**, de Blainville.

Dorsal surface bearing 8 imbricating shelly plates; head divided from the body; gills numerous, occupying a lateral groove on each side between the foot and the encircling mantle; foot adapted to creeping. They are unisexual, the genital organs and nephridia paired. The radula is well developed.

Vernacular Name.—Mail-shell.

The Shell of the Polyplacophora.

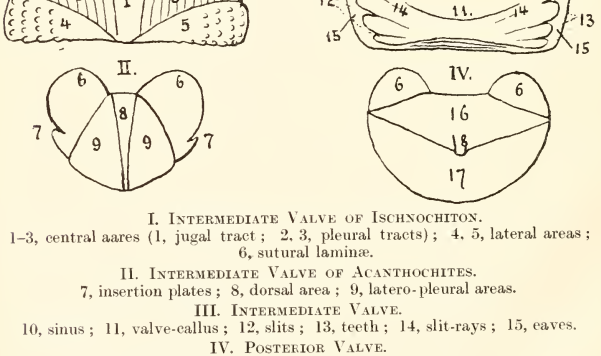
In the description of the *Chitons* technical terms are unavoidable, and the following definitions are copied from Pilsbry's excellent monograph:—

The shell in *Chitons* consists of 8 imbricating pieces or *valves*, bound together by a leathery *girdle* of connective tissue. The valves, when freed of the girdle by soaking a few hours in water, are seen to be of three forms: the *anterior* (or "head") valve, semicircular in outline, its apex elevated; the *intermediate* (sometimes called "central" or "median") valves, squarish in shape; and the *posterior* (or "tail") valve, which is like the intermediate valves, with the addition of a sloping surface behind the apex or *mucro*. *In structure, the valves are composed of two layers, generally quite different in colour and texture—an outer layer, called by Middendorf the* tegmentum; *and an inner, the* articulamentum.

The surface of the valves (*tegmentum*) is divided in nearly all *Chitons* into clearly defined or indistinct areas. The intermediate valves (I) are divided into *lateral areas* and a *central area;* the latter being subdivided into a *dorsal* or *jugal tract*, extending along the ridge of the valve, and two *pleura* or *pleural tracts*, occupying the side slopes in front of the *diagonal line* or *rib*. In some forms (II) the diagonal line is obliterated, the lateral areas and the pleural tracts being united into a single uniformly sculptured expanse, the *latero-pleural area*, on

each side, the dorsal or jugal area remaining distinct. This modification is characteristic of one great phylum of *Chitons*. As a rule, the head valve is sculptured all over like the lateral areas. The posterior valve (IV) is divided into a *central* and a *posterior* area, the former being precisely similar to the area so named in the intermediate valves, and the latter corresponding closely in sculpture to the lateral areas. In some genera the mucro is near or at the posterior edge of the valve, and the posterior area is then reduced to a narrow tract, or altogether absent. In position, the mucro may be either *anterior*, or *median*, or *posterior;* and it may be either elevated or depressed, the last being sometimes called a flat or planate mucro.

The inner layer of the valves (*articulamentum*) is larger than the *tegmentum*, projecting in front in two lobes called *sutural laminæ*, which are separated by a median bay, the *jugal sinus*. At the sides of the intermediate valves, and around the semicircle of the end valves, most *Chitons* have projecting plates called *insertion plates*, to which



I. Intermediate Valve of Ischnochiton.
1–3, central aares (1, jugal tract; 2, 3, pleural tracts); 4, 5, lateral areas; 6, sutural laminæ.

II. Intermediate Valve of Acanthochites.
7, insertion plates; 8, dorsal area; 9, latero-pleural areas.

III. Intermediate Valve.
10, sinus; 11, valve-callus; 12, slits; 13, teeth; 14, slit-rays; 15, eaves.

IV. Posterior Valve.
16, central area; 17, posterior area; 18, mucro.

the girdle is attached. These are commonly cut into *teeth* by transverse *slits*. From the slits to the apex of each valve inside run slight grooves and rows of pores, known as *slit-rays;* often they are obliterated, but in forms having a highly developed system of sense-organs in the tegmentum the pores of the slit-rays serve as nerve-foramina. The teeth are sometimes finely cut or crenulated (technically, "pectinated") between the slits; and in some forms the edges of the teeth are thickened outside, or "propped." Fig. III represents the interior of the fourth valve of an *Ischnochiton*, showing the slits, teeth, insertion plates, &c.

Key to Genera.

a. Valves lacking insertion plates .. .. .. Lepidopleurus.

aa. Valves possessing insertion plates, valves i–vii or i–viii having slits; teeth smooth or but slightly roughened between the slits, never closely, finely pectinated. Valves lacking eyes (except *Callochiton*).

b. Surface of intermediate valves divided into lateral and central areas by a diagonal (often indistinct) extending from beak to outer front angle of tegmentum; or, if this is not clearly the case, the posterior valve has an even, crescentic series of well-developed teeth; all valves having slits.

c. Posterior valve having crescentic series of well-developed teeth.

d. Valves porous at the eaves. Sutural plates connected across the sinus, side slits several (single in one species), girdle with compact diamond-patterned covering; valves with minute eyes .. Callochiton.

dd. Valves solid at eaves, girdle densely covered with flat imbricating scales, side slits single .. .. .. Ischnochiton.

cc. Posterior valve having a sinus behind, with one slit or none on each side; girdle hairy or nude, never scaly.

d. Posterior valve having a slit on each side of the median sinus .. .. .. Mopalia.

dd. Posterior valve having a median tail-sinus, but no slits .. .. .. Plaxiphora.

bb. Surface of intermediate valves divided into a narrow dorsal area and latero-pleural areas, the latter formed by the union of the lateral and pleural areas; valves more or less covered by the naked spiculose or hairy (never scaly) girdle.

c. Girdle provided with pores bearing tufts or bristles .. .. Acanthochites.

cc. Girdle spongy, produced forward .. .. Spongiochiton.

aaa. All valves, or valves i–vii, possessing insertion plates cut into teeth by slits; teeth sharply sculptured or "pectinated" outside by fine vertical grooves.

b. Valves lacking eyes.

c. Girdle scaly .. .. Chiton.

cc. Girdle leathery, with short bristles .. Eudoxochiton.

bb. Valves having eyes; posterior valve not deeply sinused behind, its insertion plate developed.

c. Girdle leathery, nude or nearly so .. .. Tonicia.

cc. Girdle covered with calcareous spines .. Acanthopleura.

bbb. Valves having eyes; posterior valve having a deep sinus behind, or lacking the insertion plate altogether. No eyes on head valve, its ribs not corresponding to slits; girdle densely scaly, slit behind .. .. Lorica.

bbbb. Valves having eyes upon the lateral areas and head valve. Insertion plate of tail valve reduced to a smooth ledge or ridge, having no posterior sinus. Girdle leathery, microscopically velvety .. .. .. Onithochiton.

Suborder 1. EOPLACOPHORA, Pilsbry.

Tegmentum coextensive with articulamentum, or the latter projecting in smooth unslit plates.

Fam. **LEPIDOPLEURIDÆ,** Pilsbry.

Leptoidea, Carpenter. *Leptochitonidæ*, Dall, "Blake" Gastrop., 1889, 414. Genus *Holochiton*, Fischer, Man., 877.

Chitons in which the head and tail valves are similarly articulated, and having the insertion plates either obsolete or, if present, without slits. Girdle finely scaly or bristly; gills short, posterior.

This family is readily known by the entire absence of insertion plates, or the simple *unslit* character of them when present. The living species are few in number, and mainly either northern in distribution or living at considerable depths. All of the Palæozoic *Chitons* yet known belong to this family, and this fact, together with the weak, imperfect articulation of the valves, causes us to regard the Leptoids as the most primitive of the existing groups. (Pilsbry.)

Genus 1. Lepidopleurus, Risso, 1826.

Lepidopleurus. Risso, Hist. Nat. de l'Europe Mérid., iv, 1826, 267 (in part). First species: *L. cajetanus*, Poli. Not *Lepidopleurus* of H. and A. Adams, Carpenter, Dall, &c. *Leptochiton*, Gray, P.Z.S., 1847, 127. *Leptochiton*, in part, of H. and A. Adams, G.R.M., i, 473; and of Chenu, Man., i, 381. (Pilsbry.)

Insertion plates absent. Girdle with minute, gravelly, smooth or striated scales, usually with a marginal fringe of longer scales.

From the Southern Hemisphere very few species are known: two from Tasmania, Australia, and New Zealand, and one each from the Kerguelen Islands, South Georgia, Straits of Magellan, and the Antarctic (Voy. du S.Y. "Belgica").

1. **Lepidopleurus inquinatus,** Reeve, 1847. Plate 2, fig. 1; Plate 3, fig. 1.

Lepidopleurus inquinatus, Reeve, Conch. Icon., Chiton, pl. 23, f. 154; Man. Conch. (1), xiv, 90. *L. liratus*, Adams and Angas, P.Z.S., 1864, 192; Man. Conch. (1), xv, 101; P. Mal. S., ii, 86, 184.

Shell oblong-ovate, small, yellowish-brown, longitudinally finely ridged. *Anterior valve* very finely radiately striate, with a few concentric grooves. *Intermediate valves* with the central areas longitudinally finely grooved, the sculpture extending over the jugum; lateral areas slightly raised, with concentric fine wrinkles and a few distinct furrows near the margin; valves broadly rounded. *Posterior valve* with fine longitudinally arranged ridges on the central area, fine concentric riblets and a few distinct furrows on the posterior area, mucro central, the posterior slope concave. *Girdle* covered with minute scales, which are rounded, convex, and strongly striated. *Colour* of the valves light yellow with a brown spot along the summit

of each valve, sometimes the upper part of the lateral areas is also brown, and the anterior valve has very often the same colour; the girdle is dirty-white. The *interior* of the valves is white, the anterior central part of the intermediate valves is finely striate; there are no insertion plates; the sinus is very broad and smooth; the sutural laminæ are narrow, high, triangularly rounded, and semitransparent; the valve-callus well developed.

Measurement of a large specimen: Length, 12 mm.; breadth, 6·5 mm. Divergence, 90°.

Type, from Tasmania, in the British Museum.

Hab.—Coasts of the North and South Islands, under stones between tide-marks; 25 fathoms, Hauraki Gulf. Found also in Tasmania, South Australia, and Victoria.

Suborder 2. MESOPLACOPHORA, Pilsbry.

Insertion plates well developed and slit.

Fam. **ISCHNOCHITONIDÆ**, Dall.

All the valves with slits, and the inner layer well covered by the outer. Insertion plates sharp, smooth, with eaves. Posterior valve with a series of well-developed teeth.

Subfam. 1. ISCHNOCHITONINÆ.

The slits of the anterior and intermediate valves do not correspond with external ribs.

Genus 1. Ischnochiton, Gray, 1847.

Ischnochiton, Gray, P.Z.S., 1847, 26. Type: *I. longicymba*, Q. & G.

Valves external, having sharp, slit, insertion plates, the teeth not buttressed. Eaves solid. Girdle covered with imbricating scales, either flat or convex, smooth or striated. Gills typically extending the entire length of the foot, but in some species they are short in front or at both ends.

Ischnochiton is the typical or central point in development of the sharp-toothed division of *Chitons*, around which the other genera naturally group themselves.

Distribution.—World-wide.

Subgen. 1. Ischnochiton, Gray (restricted).

Lepidopleurus (part), H. and A. Adams, and Carpenter, *olim*; not *Lepidopleurus*, Risso.

Valves having sharp, non-pectinated insertion plates; mucro median or anterior; girdle covered with imbricating scales.

Sect. 1. Ischnochiton, s.s.

Valves and insertion plates thin and smooth, 1 side slit in each median valve; the scales of the girdle flat and striated, sometimes smooth.

Key to Species.

A. Scales striated.
  a. Scales faintly striated, mingled with smooth scales .. *longicymba.*
  aa. Scales deeply grooved.
    b. Lateral areas with radial wrinkles, cut up into granules *contractus.*
    bb. Lateral areas with broad concentric ridges, radiate riblets present or indistinct.
      c. Shell with the margins subparallel, divergence 100° *fulvus.*
      cc. Shell oval, larger, divergence 110–120° .. .. *Parkeri.*
AA. Scales smooth, shell small .. .. *luteoroseus.*

1. **Ischnochiton contractus**, Reeve, 1847. Plate 2, fig. 3.

Chiton contractus, Reeve, Conch. Icon., Chiton. pl. 15. f. 78. *Ischnochiton contractus*, Man. Conch. (1), xiv, 93, pl. 23. f. 81, 82; Suter, P. Mal. S., vii, 293. *Chiton decussatus*, Reeve, Conch. Icon., pl. 18, f. 107. *C. castus*, Reeve, Conch. Icon., pl. 22, f. 145. *Lepidopleurus speciosus*, Ad. & Ang., P.Z.S., 1864, p. 492; 1865, p. 187.

Shell oval, subelevated, ashy, irregularly streaked with brown-olive. *Anterior valve* with close radiating wrinkles, broken into granules by concentric grooves. *Intermediate valves* broadly rounded, the central areas finely zigzaggedly wrinkled, this sculpture being somewhat effaced on the jugum; lateral areas with radiating, slightly divaricating wrinkles, which also are sometimes cut up into granules by concentric sculpture. *Posterior valve* with the same sculpture as the head valve, mucro median, posterior slope straight. *Girdle* with small, imbricating, and deeply striated scales. *Colour* yellowish-white or ashy, sometimes with longitudinal rows of brown spots in the centre or laterally; girdle light brown. *Interior* white, anterior valve with 14 sharp teeth, intermediate valves with 1 slit on each side, posterior valve with 13 slits; sinus wide, smooth; the sutural laminæ narrow, not high, rounded.

Length, 37 mm.; breadth, 17·5 mm. Divergence, 110°.

Type, from Tasmania, in the British Museum.

Hab.—Auckland Islands (Captain Bollons). Tasmania, Australia.

Remarks.—This species is, as far as I know, not in any New Zealand collection of our shells, and in 1897 I placed it amongst the species doubtfully occurring in New Zealand waters. In 1906, however, Captain Bollons brought me a small specimen (9 mm. long) which he had found at the Auckland Islands, and this proved to be the above species. The colour is yellowish-white, with 3 longitudinal rows of brown spots. The sculpture consists of the characteristic zigzag wrinkles, which are very delicate, as is to be expected in such a young specimen.

2. **Ischnochiton fulvus,** Suter, 1905. Plate 3, fig. 2, *a–d.*

Ischnochiton fulvus, Suter, J. Mal., xii, 66, pl. 9, f. 5–10; Iredale, T.N.Z.I., xl, 373.

Shell small, elongated oval, with the sides subparallel, obtusely angled, fulvous. In size, outline, and colour very much like *Lepidopleurus inquinatus*. *Anterior valve* with a few concentric ridges, minutely quincuncially punctate; the anterior margin white, the remainder uniformly fulvous; there is a slight posterior median notch. *Intermediate valves* with the whole surface minutely punctate like the anterior valve, with a few concentric ridges on the central areas, extending over the slightly raised lateral areas, where they are considerably stouter; no indication of radiate sculpture. *Posterior valve* punctate like the others, concentrically ridged, mucro subcentral, posterior slope slightly concave. *Girdle* covered with very small imbricating scales of somewhat unequal size; they are flatly convex and deeply grooved, usually 4 grooves on a scale. *Colour* varies from light to dark fulvous, the dorsal and anterior parts being always lighter-coloured; the anterior margin of the head valve, the anterior and lateral margins of the central valves, and the posterior margin of the tail valve have a narrow white border. *Interior* dirty-white; anterior valve with 12 slits at unequal distances; intermediate valves with 1 slit on each side, the posterior tooth small; posterior valve with 12 slits, the teeth unequal in size; sinus broad, deep, and smooth; sutural laminæ with the inner sides concave.

Length, 12 mm.; breadth, 7 mm. Divergence, 100°.

Type, from Te Oneroa, in my collection.

Hab.—Te Oneroa, Preservation Inlet; Brighton, Otago; Banks Peninsula (Iredale).

Remarks.—The very similar *L. inquinatus* has the intermediate valves longitudinally striated. According to Dr. Torr, this species is also found on the coast of South Australia.

3. **Ischnochiton longicymba,** Quoy and Gaimard, 1835. Plate 2, fig. 2; Plate 3, fig. 3, *a, b.*

Chiton longicymba, Q. & G., Voy. Astrol., iii, 1835, 390, pl. 75, f. 1–18; Conch. Icon., Chiton, pl. 19, f. 125; pl. 24, f. 163*d*. *Ischnochiton longicymba*, Q. & G., Man. Conch. (1), xiv, 87, pl. 22, f. 58–66; P. Mal. S., ii, 186. *I. fruticosus*, Gould: Wissel, Zool. Jahrb., Syst., xx, p. 594, pl. 21, f. 5, 6; pl. 22, f. 7–10 (anatomy); not of Gould.

Shell oblong, broadly arched, appearing smooth to the naked eye, colour very variable. *Anterior valve* with flat and numerous radiate riblets, cut up into granules by concentric furrows, which are strongly impressed near the margin. *Intermediate valves* with the central areas very closely and finely wrinkled in quincuncial pattern, extending over the jugum. Lateral areas slightly raised, with 4–12 radiating riblets, very often bifurcating, cut into nodules by growth-lines;

interspaces densely granulated. *Posterior valve* has on the central area the same sculpture as the intermediate valves on the same area, and the posterior area the same as the anterior valve; mucro subcentral, posterior slope slightly concave. *Girdle* covered with imbricating, flatly convex, and feebly striated scales, amongst which smooth scales occur. *Colour* extremely variable, mostly light green mottled with dark green, brown, yellowish-white, &c.; sometimes black with a broad light band along the back, or grey with a dark-green median band. *Interior* coloured in accordance with the ground-colour of the outer side; anterior valve with 9–12 slits, intermediate valves with 1 slit on each side, posterior valve with 11 slits; the teeth thin, sharp, and smooth; posterior tooth of the side insertion plates short, and terminating abruptly before attaining the posterior margin of the valve; sinus very broad; sutural laminæ narrow and rather high.

Length, 40 mm.; breadth, 18 mm.: mostly smaller. Divergence, about 95°.

Type in Mus. Hist. Nat., Paris.

Hab.—Throughout New Zealand and at the Chatham Islands; under stones between tide-marks; more common in the north.

Remark.—Nearly allied to *I. crispus*, Reeve, of Tasmania and Australia.

Maori.—Cara (*fide* Quoy and Gaimard).

4. Ischnochiton luteoroseus, Suter, 1907. Plate 3, fig. 4.

Ischnochiton luteoroseus, Suter, P. Mal. S., vii. 293. f. 1 in text.

Shell small, elongately oval, minutely granulate, uniformly pink or yellowish with longitudinal pink bands. *Anterior valve* with a posterior rounded sinus, finely granulated in quincuncial pattern, as is also the tegmentum of all other valves. *Intermediate valves* with the lateral areas hardly raised and not well defined, valves lightly beaked and sharply rounded. *Posterior valve* with a central mucro, a slight transverse impression below it, the posterior slope straight. *Girdle* with small, imbricating, roundish, flatly convex, and smooth scales of equal size. *Colour* pink, but mostly yellowish with concentric pink bands on the head valve, longitudinal, usually 3 on each side, on the central valves, and mostly absent on the tail valve; these bands are slightly undulating or zigzagging. *Interior* bright pink; anterior valve with 11 slits at irregular distances, intermediate valves with 1 slit on each side, posterior valve with 8 slits; corresponding with the slits there are radiate fine white lines in all valves; sinus broad and smooth; sutural laminæ broadly rounded.

Length, 5 mm.; breadth, 3 mm. Divergence, 80°.

Type in my collection.

Hab.—A few specimens and a number of valves in sand dredged in 50 fathoms, near the Bounty Islands, by Captain Bollons; Dusky Sound, in 30 fathoms (R. Henry); Stewart Island.

Remarks.—To judge from the valves gathered, the species will attain a slightly larger size, but most of my specimens are considerably smaller. The colour, smallness, and absence of radiating sculpture distinguish this species. It belongs to the group with smooth scales. A specimen from Dusky Sound is yellowish-white, mottled with brown triangular streaks and spots, crowded along the ridge, but otherwise it does not differ from Bounty Island specimens.

5. Ischnochiton Parkeri, Suter, 1897. Plate 3, fig. 5, *a–d*.

Ischnochiton Parkeri, Suter, P. Mal. S., ii, 186, f. 1–6 in text. *Lepidopleurus circumvallatus*, Reeve; Hutton, M.N.Z.M., 113, not of Reeve.

Shell oblong, angularly arched, yellowish to brown, lateral areas with feeble radial riblets. *Anterior valve* minutely decussate, with numerous radiate low riblets, which are more or less cut up into fine nodules by concentric growth-lines. *Intermediate valves* angularly arched, beaked, the sutures distantly serrate, jugum and central areas finely granulated by longitudinal and transverse zigzag wrinkles; lateral areas raised, with numerous broad, flatly rounded, concentric ridges, the interspaces faintly granulate; sometimes distinct radiate riblets, numbering 8–10, are present. *Posterior valve* with the central area finely granulate, posterior area with numerous unequal and rounded concentric ridges; mucro central, low and obtuse, posterior slope slightly concave. *Girdle* covered by small imbricating scales, which are all of about the same size, convex, deeply grooved, 3–4 grooves on each; margin of girdle with a fringe of minute spicules. *Colour* variable, from horny-yellow to chestnut-brown, mostly darker on the posterior margin of the valves, with more or less predominant black longitudinal stripes, assuming often a triangular shape, closer together or coalescing towards the girdle, jugum mostly without black markings. *Interior* blue; anterior valve with 11–13 slits, intermediate valves with 1 slit on each side, posterior valve with 12–13 slits; teeth sharp and smooth, posterior tooth of intermediate valves short, as in *I. longicymba*; sinus broad and smooth; the sutural laminæ rather low, broadly rounded; valve-callus stout.

Length, 21 mm.; breadth, 12 mm. Divergence, 110–120°.

Type, from Campbell Island, in the Otago Museum, Dunedin.

Hab.—Campbell Island; Auckland Islands; Bare Island (Schauinsland).

Remarks.—It is no doubt this species which was taken for *I. longicymba*, Q. & G., by Filhol and Hutton. According to Thiele, it is *I. melanterus*, Rochebrune.

Subfam. 2. CALLOCHITONINÆ.

With shell-eyes and united sutural laminæ.

Genus 2. Callochiton, Gray, 1847.

Callochiton, Gray, P.Z.S., 1847, 126, 168. Type: *Chiton lævis*, Montagu. Not *Callochiton* of Carpenter's earlier writings (P.Z.S., 1865, 276, &c.) = *Callistochiton*. *Clathropleura*, Thiele (part), Bull. Soc. Mal. Ital., iii, 1877, 136.

Valves exposed; insertion plates rising out of porous or spongy eaves, and cut into numerous teeth; sutural plates connected or continuous across the shallow jugal sinus.

The species are not numerous; they occur in the British seas, the Mediterranean, the Gulf of Manaar, Straits of Magellan, Chile, Australia, Tasmania, New Zealand, Cape of Good Hope, Réunion, Mauritius, Arctic station "Gauss."

Littoral to 130 fathoms.

Subgen. Callochiton, s.s.

Girdle covered with a smooth compact layer of very small diamond-shaped scales.

Key to Species.

a. Entire surface delicately shagreened	*platessa*.
aa. Central areas distinctly sculptured.	
b. A row of deep pits in front of the lateral areas	*empleurus*.
bb. Central areas with 4–5 deep grooves on each side; median valves with 2 slits	*sulculatus*.
bbb. Central areas with elevated separate longitudinal threads; median valves with 1 slit	*puniceus*.

1. Callochiton empleurus, Hutton, 1872. Plate 3, fig. 6.

Chiton empleurus, Hutton, T.N.Z.I., iv, 178. *C. crocinus*, Reeve: Pilsbry, Man. Conch. (1), xv, 67, not of Reeve. *C. empleurus*, Hutt., P. Mal. S., ii, 185; J. Mal., xii, 65, pl. 9, f. 1–4.

Shell small, elongated oval, subcarinated, slopes very slightly convex; flesh-colour, with a squarish white patch on the posterior part of the jugal tract. *Anterior valve* almost smooth, but minutely punctate and with numerous small eyes, anterior margin with square white spots at irregular distances, and faint traces of radiate riblets; posterior margin with a median notch. *Intermediate valves* with the central area minutely punctate, the jugum mostly smooth, with a few transverse shallow furrows, on the central areas in front of the anterior edge of the lateral areas 9–10 deep pits on each side, which are getting shorter and shallower towards the median part of the valve; lateral areas raised, distinct, with well-pronounced concentric ridges; the eyes are very numerous. *Posterior valve* rather indistinctly minutely punctate, with a subcentral mucro, which is studded with minute eyes, posterior slope slightly concave. *Girdle* with characteristic minute elongated glossy scales. *Colour* fleshy, lighter and with white streaks on the jugum; a white squarish spot on each intermediate valve on the posterior part of the jugum, and on the tail valve in front

of the mucro. *Interior* pink; sinus rather broad, shallow; intermediate valves with 4 slits on each side.

Length, 22 mm.; breadth, 9 mm. Divergence, 83°.

Type in the Dominion Museum, Wellington.

Hab.—Near Stewart Island, in about 15 fathoms.

Remarks.—A specimen found on oysters by Mr. C. Cooper, of Auckland, and kindly presented to me, was used for the description and figures. As I did not want to disarticulate the only specimen, the number of slits in the terminal valves still remain unknown. The habitat of this species was hitherto unknown.

2. **Callochiton platessa,** Gould, 1846. Plate 3, fig. 7, *a–d.*

Chiton platessa, Gould, P. Bost. S.N.H., ii, 143; U.S. Expl. Ex., 320, f. 434, 434*a*. *Callochiton platessa*, Gould, Man. Conch. (1), xiv, 49, pl. 10, f. 1–5; P. Mal. S., ii, 184; T.N.Z.I., xl, 374. *Chiton crocinus*, Reeve, Conch. Icon., pl. 22, f. 146. *Callochiton crocinus*, Reeve, Man. Conch. (1), xv, 67, pl. 10, f. 7. *Chiton versicolor*, Angas, P.Z.S., 1852, 92, pl. 16, f. 5. *Leptochiton versicolor*, Angas, P.Z.S., 1867, 223.

Shell oval, surface delicately shagreened, no radial sculpture; colour orange or yellowish-white, with end valves and part of the central valves orange. *Anterior valve* with a few indistinct concentric lines of growth. *Intermediate valves* rounded, beaked, the central areas with fine transverse lines, lateral areas elevated, with a number of distant low concentric ridges, very rarely an indication of a few radiate furrows. *Posterior valve* with the central area distinctly separated from the posterior area by a straight transverse line, posterior area with a few concentric growth-lines; mucro median, very low, posterior slope but slightly convex. *Girdle* with delicate flat elongated scales. *Colour* very variable, orange with yellowish longitudinal bands, alternating orange and white spots on the sutures, or head and tail valve orange, the latter with a white triangular spot in the middle of the central area, the intermediate valves yellowish or reddish white, with orange spots on the beaks; there are minute black dots (eyes) present, which are absent from the central areas; the girdle brownish, with a few small white flecks and 5 large white spots, 4 very large spots extending from the first and sixth suture to the edge of the girdle. *Interior:* Anterior valve with 16 slits, intermediate valves with 3 slits on each side, posterior valve with 14 slits; teeth solid, bifid or 3-shaped, propped outside; eaves very spongy, simple, short; sinus small, wide; sutural plates united.

Length, 19 mm.; breadth, 13 mm. Divergence, 120°.

Type in the U.S. National Museum, Washington.

Hab.—Port Pegasus, Stewart Island, 18 fathoms (Captain Bollons); Lyall Bay (W. H. Webster); Shag Point (Iredale). Australia.

Remarks.—There is one specimen, locality unknown, in the Dominion Museum, Wellington. This is one of our very rare species.

3. Callochiton puniceus, Gould, 1846. Plate 3, fig. 8, *a–c*.

Chiton puniceus, Gould, P. Bost. S.N.H., ii, 1846, 143; U.S. Expl. Ex., xii, 1852, 324, f. 412. *Ischnochiton puniceus*, Couthouy: Pilsbry, Man. Conch. (1), xiv, 81, pl. 8, f. 76, 77. *Callochiton* (*Icoplax*) *puniceus*, Gould, "Deutsche Südpolar Expedition"; Thiele, "Die antarktischen und subantarktischen Chitonen," 1908, 14. *Chiton illuminatus*, Reeve, Conch. Icon., iv, 1847, pl. 22, f. 147. *Callochiton illuminatus*, Reeve, Man. Conch. (1), xiv, 51, pl. 9, f. 92–94; Suter, P. Mal. S., ii, 185, vii, 294; Melville and Standen, Scottish Antarct. Exp., Moll., 126. *Chiton dimorphus*, Rochebrune, Miss. Cap Horn, Moll., 142, pl. 9, f. 10.

Shell oval, rather elevated, granulose, central areas with longitudinal threads, colour red or green. *Anterior valve* granulose, no radiate sculpture, numerous small black eyes. *Intermediate valves* wrinkle striate and granulose all over, the jugum acute, central areas with slender elevated separated threads, parallel to the jugum, 6–14 on each side; lateral areas granulose, with 2 rows of eyes, no radial sculpture. *Posterior valve* with numerous longitudinal threads on the central area, posterior area minutely granulose and with a fair number of eyes; mucro a little in front of the middle, slightly elevated. *Girdle* with small elongate scales. *Colour* of type red, New Zealand specimens sometimes greenish-grey; girdle of the same colour, often spotted with paler at the sutures. *Interior* roseate or greenish, anterior valve with 15–16 slits, intermediate valves with 1 slit on each side, posterior valve with 11–14 slits; teeth acute, quite distant, scarcely propped; eaves spongy; sinus small, the sutural plates connected across it.

Length, 16 mm.; breadth, 10 mm. Divergence, 120°.

Type, from Tierra del Fuego, in the U.S. National Museum, Washington. Of *C. illuminatus*, from Straits of Magellan, the type is in the British Museum.

Hab.—One specimen, dredged near Kapiti Island, in the Canterbury Museum; another full-grown yellowish-red specimen from 18 fathoms, Port Pegasus, Stewart Island, is in Professor Chilton's collection; a young greyish-white specimen from 50 fathoms, near the Snares Islands, is in my collection. The latter two specimens were dredged by Captain Bollons. Common in the Magellan Province.

Remarks.—In having but 1 slit in the median insertion plates and in the want of props on the teeth this species is abnormal; in other respects it agrees with *Callochiton* (Pilsbry). Thiele is of opinion that the green specimen from Kapiti Island may prove to be a distinct species. In many species of the *Chitons* the colour is not of specific value.

4. Callochiton sulculatus, Suter, 1907. Plate 3, fig. 9.

Callochiton sulculatus, Suter, P. Mal. S., vii, 294, f. 5 in text.

Shell very small, oval, angularly raised, side slopes straight, central areas laterally grooved, colour light fulvous. *Anterior valve* with a

few fine growth-lines, otherwise smooth, the whole surface dotted with small black eyes. *Intermediate valves* having the jugum sharply rounded, central areas microscopically longitudinally closely striate, 4 to 5 deep grooves on each side, the innermost extending only over half the length ; lateral areas distinctly raised, microscopically radially striate, with numerous eyes, flatly and broadly nodulous by a few concentric furrows, more pronounced near the margins ; sutures crenate. *Posterior valve* smooth, with many eye-dots ; mucro in front of the middle, low ; posterior slope slightly concave. *Girdle* with elongated, pointed, and slightly keeled smooth scales. *Colour* light fulvous, darker on the end valves and lateral areas ; girdle white, with fulvous patches. *Interior* pinkish-white ; anterior valve with 14, median valves with 2 slits on each side, and posterior valve with 10 slits ; teeth blunt, propped up on the outside ; eaves spongy ; the low and broadly rounded sutural laminæ continuous across the shallow sinus.

Approximate dimensions : Length, 9 mm. ; breadth, 6 mm. Divergence, 105°.

Type in my collection.

Hab.—Dusky Sound, 30 fathoms (R. Henry).

Remarks.—With regard to sculpture, this species stands between *C. empleurus* and *C. puniceus ;* the former, however, has only deep pits on the lateral areas, and the median valves with 4 slits ; the latter has elevated longitudinal threads on the lateral areas, and the median valves with 1 slit only.

Fam. **MOPALIIDÆ**, Pilsbry.

Placiphoroidea (part) and *Mopaloidea* (part). Carpenter. Not *Mopaliidæ*, Dall.

Chitons in which the valves are divided in the normal manner into lateral and central areas ; the teeth of insertion are not pectinated ; and the posterior valve has a posterior-median sinus, with 1 slit on each side, or none. The girdle is more or less hairy, never scaly. Gill-row as long as the foot.

The normal number of slits in the anterior valve is 8 ; but this is often increased or diminished by splitting or fusion of 1 or 2 teeth. The slits correspond in position to external ribs. The intermediate and posterior valves have not more than 1 well-developed slit on each side, and even this is lacking in the tail valve of *Plaxiphora.*

The girdle is frequently provided with pores at the sutures, each pore generally bearing 2 or several bristles or hairs ; but the presence or absence of these pores is in no case of more than specific value, and in some cases I have found it to be a mutable feature among individuals of the same species. (Pilsbry.)

Genus 1. Mopalia, Gray, 1847.

Mopalia, Gray, P.Z.S., 1847, 65, 69, 169 (exclusive of section xx). Type : *Chiton Hindsii*, Sowerby. *Molpalia*, Gray, 1857 (err. typ.). *Osteochiton*, Dall, 1886.

Valves normally proportioned, transverse, not beaked, exposed, the girdle somewhat encroaching at the sutures. Sinus small; insertion plate of anterior valve rather long, sharp, slit into nearly smooth teeth, which are somewhat thickened at the edges of the slits, the latter being normally 8 in number and corresponding in position to external ribs. Median valves having similar 1-slit insertion plates. Posterior valve depressed, the mucro post-median, insertion plate rather sharp, smooth or roughened, *having an oblique slit on each side* (rarely doubled) and a larger sinus in the middle behind. Girdle wider at the sides than in front, leathery, more or less hairy, the hairs simple; with or without sutural pores.

The genus is known only from the shores of the northern Pacific, extending from Lower California to Alaska and Japan. It may be regarded as the most primitive of the existing genera of *Mopaliidæ*, *Placiphorella* and *Plaxiphora* being special modifications of the *Mopalia* type. The small additional slits occurring in some forms are cases of partial reversion to the multifissate ancestral form which gave rise to the family. (Pilsbry.)

Our species is the first recorded from the Southern Hemisphere.

1. Mopalia australis, Suter, 1907. Plate 3, figs. 12, 12*a*.

Mopalia australis, Suter, P. Mal. S., vii, 215, pl. 18, f. 12.

Shell very small, elongately oval, with a blackish leathery girdle and sutural tufts. *Anterior valve* with 8 slits, teeth smooth. *Intermediate valves* with a rounded central posterior projection, insertion plates with 1 slit on each side. *Posterior valve* depressed, with an oblique slit on each side and bisinuate in the middle behind. *Girdle* narrow, leathery, slightly broader on the sides, with a few sutural bristles. *Colour* probably ash-grey, with a few longitudinal brown stripes over the jugum. *Interior* bluish-grey, with a posterior brown margin; on the intermediate valves the tegmentum forms a narrow band by passing beyond the articulamentum; sinus broad and slightly pectinate; the sutural laminæ narrowly rounded; the valve-callus is quite distinct.

Length, 9 mm.; breadth, 5·5 mm. Divergence, about 120°.

Type in my collection.

Hab.—Snares Islands (Captain Bollons).

Remarks.—I am indebted to Captain Bollons for two specimens he collected at the Snares Islands. Both examples are so much corroded that it is impossible to recognise any sculpture, if it was present. The side slits of the posterior valve leave no doubt about the generic position.

Genus 2. Plaxiphora, Gray, 1847.

Plaxiphora, Gray, P.Z.S., 1847, 65, 68, 169. Type: *Chiton setiger*, King. *Placiphora*, Cpr. MS. and Dall, 1881. *Placophora*, Dall; not *Placophorus*, Mulsant, 1873. *Euplaxiphora*, Shuttleworth. *Chætopleura* (part), Rochebrune, not *Chætopleura*, Shuttleworth. (Pilsbry.)

Valves mostly exposed, all having insertion plates developed, that of the anterior valve normally with 8 (sometimes 7–9) slits. Median valves 1 slit. Posterior valve having the insertion plate smooth, unslit, interrupted behind by a median rounded sinus, which does not generally emarginate the tegmentum; mucro posterior. Girdle bearing simple bristles or hairs, scattered or gathered into pores or tufts at the sutures.

Subgen. 1. Plaxiphora, s.s.

Slits of anterior valve normally 8, corresponding in position to external ribs; the teeth long outside. Girdle widest at the sides. Mantle not fringed in front of the head.

Distribution.—Southern extremities of the southern continents: New Zealand, Australia, Tasmania, South Africa, Tristan da Cunha, and South America.

Key to Species.

A. Valves exposed.
  a. Posterior valve not greatly reduced in size or altered in form.
    b. Central areas unsculptured save for growth-lines.
      c. Sutural pores or tufts distinctly developed.
        d. Lateral areas with 2 to 4 low, flat ribs; shell large .. .. *superba.*
        dd. Lateral areas with 2 raised, rounded ribs; shell small .. .. *aucklandica.*
      cc. Sutural pores absent, girdle densely covered with bristles .. .. *glauca.*
    bb. Central areas sculptured, at least at the sides.
      c. Sculpture rather coarse.
        d. Shell large; sutural pores with bifurcating bristles; girdle broad, reddish .. *biramosa.*
        dd. Shell small; sutural pores with more than 2 bristles; girdle narrow, white or white and black .. .. *cælata.*
      cc. Sculpture excessively fine .. .. .. *Murdochi.*
  aa. Posterior valve reduced to a narrow crescentic form, strongly arched upwards .. .. *ovata.*
B. Valves partially immersed in the girdle, which encroaches at the sutures; no sutural pores .. .. *obtecta.*

Sect. 1. Plaxiphora, s.s.

Euplaciphora, Shuttleworth, not Carpenter.

Valves exposed. Entire shell normal in form; posterior valve not greatly reduced in size or altered in form.

1. **Plaxiphora aucklandica,** Suter, 1909. Plate 3, fig. 10.

Plaxiphora aucklandica, Suter, Subantarct. Islds. N.Zeal., i. 1909, 2, pl. 1, f. 1.

Shell small, elongately oval, depressed, valves very fragile, dorsal ridge subangular; colour light brown, jugal tract whitish, white dashes on the sides; girdle wide, black, with sutural tufts of very long bristles. *Anterior valve* short and broad, flattish, with 8 granulated radial ribs. *Intermediate valves* wide, depressed, the jugum smooth, roundly angled; pleural tracts smooth, with very fine growth-lines; lateral areas not raised, with 2 narrow granulated ribs, the interspaces smooth. *Posterior valve* smooth, small, the mucro posterior, the hind slope nearly straight. *Girdle* broad, with very prominent sutural tufts formed by 3 to 4 very long light-brown bristles; 5 tufts round the anterior and a few round the posterior valve; a second series of tufts with shorter bristles near the margin, which is beset with short brownish hairs; remainder of the girdle quite naked, smooth. *Colour* of the valves light brown, intermediate and tail valves usually with a dorsal triangular white area with a longitudinal brown median line; 1 or 2 white elongated spots are mostly present on the pleural, rarely on the lateral, areas; girdle black.

Length, about 15 mm. Divergence, 105°.

Type in the Canterbury Museum, Christchurch.

Hab.—Musgrave Harbour, Auckland Islands (Edgar R. Waite).

Remark.—The valves are so exceedingly brittle that it was impossible to disarticulate the specimen without completely destroying it.

2. **Plaxiphora biramosa,** Quoy and Gaimard, 1835. Plate 3, fig. 4; Plate 2, fig. 11.

Chiton biramosus, Q. & G., Voy. Astrol., iii, 378, pl. 74, f. 12–16. *Plaxiphora biramosa*, Q. & G., Man. Conch. (1), xiv, 319, pl. 68, f. 51–54; P. Mal. S., ii, 188. *P. setiger*, King: Wissel, Zool. Jahrb., Syst., xx, 603, pl. 22, f. 16–18, not of King.

Shell ovoid, elongated, flattened, valves very transverse, girdle red-brown, with bifurcating bristles at the sutures. *Anterior valve* with 8 radiate ribs, cut into nodules by zigzagging concentric shallow grooves. *Intermediate valves* much depressed, with the jugum keeled; pleural areas densely longitudinally wrinkled, the wrinkles coarse in front of the lateral areas, finer in front, oblique on the jugum; lateral areas concentrically wrinkled, 2 strongly nodulous ribs—one in front, the other at the suture. *Posterior valve* small, slightly concave, transversely striated; an elevated ridge runs to the terminal mucro, which forms a transverse ridge. *Girdle* vivid red, having 2 spaced series of rough, sparse, and bifurcating hairs, the inner series contiguous to the valves, the other near the periphery of the girdle, which is also hairy. Besides the sutural pores there are 5 in front and 2 behind. The girdle with a deep posterior slit, its depth, however, being variable. *Colour* mostly green, with longitudinal red-brown flamules on the

anterior half of the central valves; head valve with a brown spot on the umbo, and a few concentric brown lines near the anterior margin; tail valve the same colouring as the central valves. *Interior* white, the anterior valve with 8 slits, intermediate valves with 1 slit on each side, posterior valve without slits; sutural laminæ not wide, separated only by a very obtuse sinus.

Length, 45 mm.; breadth, 31 mm. Divergence, 140–150°. The largest specimen I found measured 60 mm. by 40 mm.

Type in Mus. Hist. Nat., Paris.

Hab.—French Pass (type); Cook Strait; Te Onepoto, near Sumner.

Remarks.—This species is rare and local. It is found near low-water mark, on rocks in exposed situations, and mostly hidden between seaweeds. As the Chiton is almost always covered by Nulliporites and seaweeds, it is not easy to see it. The colour is subject to great variation, but green and red-brown are always predominating. The posterior fissure of the girdle has formerly been overlooked; very often it is extending to the tail valve, as in *Lorica*, but not affecting the valve in any way. Sometimes this fissure is reduced to a simple notch.

Pilsbry makes *P. superba*, Carpenter, MS., a synonym of *P. biramosa*, but I cannot share his opinion. Carpenter's species is identical with the very variable *P. subatrata*, Sut. Mr. E. A. Smith, of the British Museum, kindly sent me a photograph of the type of the former, and there is not the least doubt that the two are conspecific.

3. **Plaxiphora cælata**, Reeve, 1847. Plate 2, fig. 5.

Chiton cælatus. Reeve, Conch. Icon., Chiton, pl. 17, f. 101. *Plaxiphora cælata*, Reeve, Man. Conch. (1), xiv, 328, pl. 58, f. 21, 22; P. Mal. S., ii, 189. *Tonicia ziczac*, Hutton, T.N.Z.I., iv, 180. *Chiton* (*Plaxiphora*) *terminalis*, E. A. Smith, Ereb. & Ter., 4, pl. i, f. 13; Man. Conch. (1), xiv, 326, pl. 51, f. 14. *Chætopleura Hahni*, Rochebrune: Wissel, Zool. Jahrb., Syst., xx, 600, pl. 21, f. 12: pl. 22, f. 13–15 (anatomy); not of Rochebrune.

Shell elongately oval, roundly angled along the top of the valves, mostly dark brown or black with white markings, girdle hairy. *Anterior valve* radiately 8-ribbed, with diverging oblique striations on each side of them. *Intermediate valves* mucronated, the whole surface covered with distinct wrinkles, stouter in front of the lateral areas, diverging from both sides of the jugum, and like the webs from the shaft of a feather from the lateral areas, which are but little raised, with a high radiating nodulous rib in front, and 1 along the suture, which bears coarse concentric lamellæ near the margin; sutures crenulated. *Posterior valve* with concentric wrinkles, the mucro posterior, with a smooth triangular space in front. *Girdle* covered with rather sparse brown horny bristles, and with distinct sutural pores. *Colour* mostly brown, black, or bluish-black, with a white wedge-shaped stripe with a black one within it down the centre of the valves, sometimes a few short white dashes diverging from the radiating ridges; very rarely ornamented with green and pink. *Interior* light

blue; anterior valve with 8, central valves with 1 slit on each side; teeth sharp, lightly furrowed on the outer side; tail valve with a strong smooth and sinuated insertion plate; sinus deep, convex; sutural laminæ rounded, stout; a strong valve-callus.

My largest specimen is 45 mm. long by 22 mm. broad. An average specimen: length, 25 mm.; breadth, 11 mm. Divergence, 100–110°.

Type in the British Museum (Cuming collection).

Hab.—Coasts of the North and South Islands, more common in the south; Chatham Islands: under stones between tide-marks.

Remarks.—The ornamentation is very variable, and the ground-colour varies from white to dark brown and black. The green-and-pink colour-pattern mentioned by Reeve is very rarely met with; I found it only on specimens living in kelp-roots.

4. **Plaxiphora glauca,** Quoy and Gaimard, 1835. Plate 3, fig. 13.

Chiton glaucus, Q. & G., Voy. Astrol., iii, 376, pl. 74, f. 7–11. *Plaxiphora glauca*, Q. & G., Man. Conch. (1), xiv, 325, pl. 68, f. 68–72; J. Mal., xii, 66. *? Plaxiphora ciliata*, Angas, P.Z.S., 1865, 187; not *Chiton ciliatus*, Sowerby.

Shell oval, widened at the sides, widely rounded, smooth; greenish, with black markings. *Anterior valve* with 8 low radiate riblets, interstices smooth. *Intermediate valves* broadly rounded, with fine transverse lines of growth on the central areas; lateral areas not raised, distinguished by a low rounded anterior rib; sometimes 1 or 2 more radiate, but always indistinct, ribs may be seen. *Posterior valve* convex, with transverse lines, mucro terminal. *Girdle* of a beautiful green (brown when dry), covered with rigid but not acute bristles of the same colour. *Colour* brown, with longitudinal oblique and slightly undulating bands of bluish-green; along the back there is a triangle of light brown, margined by bluish-green, on each of the central valves. *Interior* emerald-green, anterior valve with 8 slits, intermediate valves with 1 slit on each side, tail valve with a smooth insertion plate; sinus wide, spongy, sutural laminæ broadly rounded, light blue.

Length, 50 mm.; breadth, 37 mm.

Type.—Mus. Hist. Nat., Paris.

Hab.—Chatham Islands (Fougère). The type is from d'Entrecasteaux Channel, Tasmania. South Australia.

Remarks.—Specimens from the Chatham Islands are in my collection. It is rather curious that such a large shell should not have been recorded before.

5. **Plaxiphora Murdochi,** Suter, 1905. Plate 3, fig. 16.

Plaxiphora Murdochi, Suter, J. Mal., xii, 67, pl. 9, f. 11.

Shell rather small, oval, slightly narrowed behind, roundly angled along the top of the valves, blackish-green, finely sculptured, intermediate valves mucronated; girdle narrow, of a minutely scaly appearance, and with sparse hairlets. *Anterior valve* radiately 8-ribbed,

with fine diverging striæ, which are coarser near the anterior margin and form elongated nodules on the posterior margin. *Intermediate valves* with a lighter-coloured posterior mucro, the whole surface sculptured with fine striæ; the lateral areas distinctly marked off by an elevated ridge descending from the mucro and dissolving into numerous fine striæ, the striæ of the lateral and central areas radiate from that ridge like the webs from the shaft of a feather; sutures with a row of nodules; central areas with diverging riblets on the jugum, but straight and parallel to the jugum on the sides. *Posterior valve* small, slightly emarginate behind; mucro terminal, slightly raised, from the elevated postero-lateral ribs the fine striæ diverge straight in front, obliquely on the posterior area. *Girdle* has, viewed with an ordinary pocket-lens, the appearance of being minutely scaly, but a more powerful lens reveals the fact that the whole surface is densely pitted; near some of the sutures tufts of a few light-coloured bristles, and a few hairlets near the margin; it seems probable that the bristles are deciduous. *Colour* blackish-green, girdle a little darker; the anterior valve with a few concentric light-blue zigzag bands; the intermediate valves have a number of wavy longitudinal blue streaks running over the lateral and central tracts; the posterior valve with an indistinct blue patch on each side; anterior valve with 8 slits; teeth strong, broadly grooved on the outside; intermediate valves with 1 slit on each side; posterior valve with a smooth insertion plate and a posterior median sinus.

Length, 17 mm.; breadth, 13 mm. Divergence, 108°.

Type in my collection.

Hab.—Near entrance to Kawhia Harbour, on rocks at half-tide, much exposed to heavy seas. type (R. Murdoch); Port Molyneux (Dr. Torr).

Remark.—Sculpture similar to that of *biramosa* and *cælata*, but much finer.

6. **Plaxiphora superba,** Pilsbry, 1893. Plate 2, fig. 6; Plate 3, fig. 14.

Plaxiphora superba, Pilsbry, Man. Conch. (1), xiv, 319, pl. 68, f. 55–61.
P. subatrata, Suter, P. Mal. S., ii, 1897, 190, f. 7–11.

Shell large, oval, moderately elevated, dorsal ridge acute, rounded and worn off in old specimens, reddish-olive, brown, or olive, with a few transverse blackish bands, girdle with sutural pores. *Anterior valve* subangled by 8 radii, which slightly undulate the peripheral margin; otherwise nearly smooth except for growth-lines, or strongly concentrically ridged and the ribs almost obsolete. *Intermediate valves* nearly rectangular, transversely elongate to very narrow, having a "false apex" in front, and more or less distinctly beaked behind; the whole surface smooth except for growth-lines, and 2 flat, sometimes nodulous, ribs bounding the but-little-raised lateral areas; the ribs may increase to 4. *Posterior valve* small, depressed, concentrically ridged, mucro subposterior to terminal, but little elevated. *Girdle*

broader at the sides, leathery, tan colour, dark brown or black when dry, with sutural pores with long corneous bristles, 2 to 6 in a tuft, and a second row of alternating tufts and bristles along the margin; in front of the end valves 6, rarely 5, smaller pores. *Colour* reddish-olive, maculated with darker and paler; or reddish-brown, the jugum dirty-pink or with a wedge-shaped white stripe with a brown one in the centre. *Interior* white tinged with blue, or distinctly blue; anterior valve with 8 irregularly placed slits; teeth sharp, striated on the outside; intermediate valves with 1 slit on each side, the posterior tooth broad; posterior valve with a rounded elevated insertion plate and a narrow sinus in the middle behind. Sinus narrow, short; sutural laminæ continuous over the anterior false apex.

Length, 60 mm.; breadth, 40 mm.: divergence, 110°. Length, 75 mm.; breadth, 45 mm.: divergence, 125° (*subatrata*).

Type in the British Museum (Cuming collection, No. 2).

Hab.—Auckland Islands, Campbell Island (Captain Bollons); Macquarie Island (A. Hamilton).

Remarks.—The species was described in MS. by Carpenter, and published by Pilsbry, who considered it to be a synonym of *P. biramosa*. In 1897 I published a note (P. Mal. S., ii, 188) saying that I could not share Pilsbry's opinion, and that *P. superba* was much nearer *P. subatrata*. When describing the latter species I had only dry, badly preserved specimens from Macquarie Island and one spirit specimen from Campbell Island at my disposal, and in all these the valves are much narrower than in the type. Captain Bollons has of late most kindly brought well-preserved specimens from Campbell and Auckland Islands, and the study of this material has convinced me that *P. subatrata* cannot be considered a distinct species—not even a valid subspecies. The shape of the intermediate valves is subject to great variability, from very narrow and high to very wide and low, but all intermediate grades occur, and I found it perfectly useless and next to impossible to separate the two forms. The proportion of the longitudinal to the transverse width of the valves I found to vary from 1 : 2 to 1 : 3.

This species may be *P. Campbelli*, Filhol (Compt. Rend., xci, 1880, 1095), which, however, is quite insufficiently described, and has never been figured.

The specimens from Macquarie Island have the valves thickly covered by Nulliporites, those from Campbell Island by Polyzoa.

Sect. 2. Guildingia, Pilsbry.

Guildingia, Pilsbry, Man. Conch. (1), xiv, 1893, 312, 329; and Dall, U.S. Nat. Mus., 1881, 284, 288. Type: *G. obtecta*, Pilsbry.

Shell and girdle like *Plaxiphora*, except that the valves are partly immersed by the encroachment of the girdle.

Remarks.—The validity of this section seems to me rather doubtful, as the encroachment of the girdle is an extremely variable character. The only species known is the type. Dried specimens very often show no encroachment of the girdle at all.

7. **Plaxiphora obtecta,** Pilsbry, 1893. Plate 2, fig. 7.

Plaxiphora obtecta, Pilsbry, Man. Conch. (1), xiv, 330. *Mopalia ciliata*, Sowerby: Hutton, M.N.Z.M., 116, not of Sowerby. *Plaxiphora Suteri*, Pilsbry, "Nautilus," viii, 1894, 8; Suter, P. Mal. S., ii, 190. *P. glauca*, Q. & G.; Wissel, Zool. Jahrb., Syst., xx, 606, pl. 21, f. 19; pl. 22, f. 20, 21 (anatomy); not of Quoy and Gaimard.

Shell large, oval, olive-brown, nearly smooth, broad, partly covered. *Anterior valve* smooth, with very fine growth-lines, but rarely with subobsolete radial ribs. *Intermediate valves* smooth, distinct growth-lines near the anterior margin; lateral areas indistinct, but there is a slight indication of a diagonal rib. *Posterior valve* transversely finely striated, mucro terminal, low. *Girdle* broad, narrower at the ends, sometimes encroaching at the sutures to a considerable extent, the girdle reaching to within a short distance of the jugal tract; there are no sutural pores, but amongst the bristles scattered more or less densely there are a number of tufts with 2 to 3 larger bristles, and of these 1 may occasionally be situated near a suture. *Colour* as a rule olive-brown, a white ridge running down the centre, wedge-shaped on each valve, and with a central reddish-brown stripe; head valve with small blue dots, sometimes with blue zigzag bands; the other valves with blue zigzag markings of various size; more often the whole surface is yellowish-brown, lighter upon the dorsal ridge. *Interior* blue, fading to white on the sutural plates; anterior valve with 8–9 slits, teeth strong, sharp, finely striated on the outside; intermediate valves with 1 slit on each side, posterior tooth pointed; end valve with a broad, low, rounded insertion plate; on valves 1–7 the tegmentum is overreaching the articulamentum on the posterior margin; the sinus is broad, slightly spongy; sutural laminæ strong, high, rounded; valve-callus stout.

Length, 50 mm.; breadth, 32 mm.: divergence, 120° (type). Length, 48 mm.; breadth, 27 mm. (medium-sized specimen). Length, 87 mm.; breadth, 57 mm. (my largest specimen).

Type in the British Museum.

Hab.—Coasts of both Islands, more common on the west coasts; on rocks exposed to the full force of the surf. The very large specimen was collected by Captain Bollons on Canoe Rock, in the Hauraki Gulf.

Remarks.—The species was described by Carpenter in MS., and published by Pilsbry.

P. Suteri, Pils., is founded on a dry specimen showing almost no encroachment of the girdle. Carpenter says that the girdle is situated

behind. This was, no doubt, produced when the specimen was dried; in fresh examples I never observed a posterior sinus. The bundles of about 3 large horn-like hairs at the sutures, mentioned by Carpenter, are not shown in the photograph of the type, and are certainly not a regular feature. This character, now proved to be incorrect, has always prevented me from uniting the two species.

Sect. 3. Fremblya, H. Adams, 1866.

Fremblya, H. Ad., P.Z.S., 1866, 445. Type: *F. egregia*, H. Ad.

Shell and girdle like *Plaxiphora*, except that the former is short and broad, the tail valve very much reduced in size, strongly arched upward in the middle behind. Slits in intermediate valves posteriorly situated. Girdle having more or less obvious sutural pores.

8. **Plaxiphora ovata**, Hutton, 1872. Plate 2, fig. 8; Plate 3, fig. 15.

Acanthochætes ovatus, Hutt., T.N.Z.I., iv, 182. *Plaxiphora ovata*, Hutt., Man. Conch. (1), xiv, 332, pl. 54, f. 34–40.

Shell short-oval, very wide in the middle, very rapidly narrowing toward the ends; moderately elevated, the dorsal ridge carinated, side slopes slightly convex. Surface lustreless, sculpture in herring-bone pattern. Colour buff. *Anterior valve* small, its width about that of one side slope of the fourth valve, its apex elevated and slightly recurved; surface having 8 strong ribs, besides those at the sutural margins, the anterior rib strongest and wider apart; ribs nodose, intervals obliquely corrugated. *Median valves* broadly V-shaped, the apices of the valves elevated and acute. Lateral areas narrow, a little elevated, the diagonal rib sculptured with a series of closely superimposed Vs, their apices directed toward the beak of the valve, one limb of each V directed outward, curving, and forming the sculpture of the pleura, the other limb forming an oblique corrugation of the lateral area. Sutural margin of each lateral area oblique, coarsely granose. Central areas having a nearly smooth band along the dorsal ridge, and numerous slightly curving and diverging riblets on each side. *Posterior valve* small, forming an extremely narrow crescent, strongly curved upward at the acute posterior mucro, the front (" central ") area narrow, concave; viewed from behind, it presents the appearance of a wide inverted V. *Girdle* rather narrow, yellowish, bearing a pore-tuft of hyaline white bristles at each suture and a fringe of bristles at the edge. *Colour* buff along the ridge, pale olive-green on the side slopes, with a small curved dark spot or two on each valve. *Interior* bluish-white; anterior valve having 8 slits, median valves 1 slit; posterior valve having a keel-like insertion plate without slits on each side, and a broad sinus in the middle behind; sinus exceedingly broad, rounded, the sutural plates widely separated; insertion plates long, having the slit near the posterior edge of the plate. (Pilsbry.)

Length, 15 mm. ; breadth, 13 mm. Divergence, 112°.

Type in the Dominion Museum, Wellington.

Hab.—South Island and Wellington Harbour ; mostly found in kelp-roots.

Remarks.—The black spots on the valves are not always present. A specimen with 6 valves only is recorded by Iredale (T.N.Z.I., xl, 375, pl. 31, f. 1).

Fam. **ACANTHOCHITIDÆ**, Pilsbry.

Chitons in which the valves are more or less immersed in the smooth or hairy (never scaly) girdle ; the tegmentum, or outer layer, therefore being much smaller than the articulamentum, or inner layer, and having the exposed surface (when present) divided into dorsal (or jugal) and latero-pleural areas, the latter formed by the union of lateral areas with the sides of the central areas. Insertion teeth sharp, nearly smooth. Body not vermiform. Posterior valve either slit similarly to the head valve or having a posterior median sinus ; the mucro submedian.

Besides the positive and negative characters given above, the species of this family generally have 5 slits in the head valve, and median or short gills. (Pilsbry.)

Genus 1. Acanthochites, Risso, 1826.

Acanthochites, Risso, Hist. Nat. de l'Europe Mérid., iv, 1826, 268. First species : *A. communis*, Risso.

Valves partially buried in or covered by the girdle, the exposed part consisting of a smooth or striated dorsal band, and granulated side areas, the latter sometimes lacking. Anterior valve with 5 symmetrically placed slits ; median valves with 1 slit on each side ; posterior valve with 2 or several slits. Girdle varying from densely hairy to naked, but always having 4 bristle-bearing pores around the head valve, and a single series of pores on each side placed at the sutures. Gills short, extending forward from one-third to three-fourths the length of the foot. (Pilsbry.)

The girdle-pores seem to be a constant generic character ; they are normally 18 in number.

Distribution.—World-wide.

Key to Species.

a. Anterior valve without radiating ribs ; not obviously lobed around the lower edge of tegmentum.
  b. Tail valve with one slit on each side ; girdle covered with spicules and having well-developed tufts .. .. *zelandicus.*
  bb. Tail valve with several slits ; girdle naked, leathery, covering the valves except for a linear band at the ridge ; small tufts on tubercles .. .. *porosus.*

aa. Anterior valve having 5 radiating ribs, its lower margin 5-lobed; girdle with 18 small pore-tufts.
b. Girdle leathery, naked except tufts .. .. .. *violaceus.*
bb. Girdle covered with white spicules, especially at the margin .. .. *rubiginosus.*
bbb. Girdle leathery; latero-pleural areas with elongated granules .. .. *Mariæ.*

Sect. 1. Acanthochites, s.s.

Acanthochetes, Gray, P.Z.S., 1847, 169. *Acanthochiton*, Herrmansen, Indic. Gen. Mal. Prim., i, 2. *Acanthochistes*, Costa, Faun. Reg. Nap., 2. *Phakellopleura*, Guilding, Zool. Journ., v, 28. *Stectoplax*, Carpenter, in Dall, Proc. U.S. Nat. Mus., 1881, 284, 288, 289, 291.

Valves partly covered, the anterior lacking radiating ribs; the posterior valve having the insertion plate with a single slit on each postero-lateral edge, and a wide toothless sinus in the middle behind. Girdle with large dense tufts of glistening spicules. (Pilsbry.)

Type: Chiton fascicularis, L.

In this, the typical section, the tail valve has been further differentiated from the primitive type than in the other sections. The hairs of the girdle, and especially the tufts, are more exuberantly developed than in any other group of *Chitons*. (Pilsbry.)

1. Acanthochites zelandicus, Quoy and Gaimard, 1835. Plate 2, fig. 9; Plate 4, fig. 1.

Chiton zelandicus, Q. & G., Voy. Astrol., iii, 400, pl. 73, f. 5–8. *Acanthochites zelandicus*, Man. Conch. (1), xv, 16, pl. 14, f. 9, 10; P. Mal. S., ii, 192. *Acanthochætes Hookeri*, Gray, in Dieff. N.Z., ii, 262. *Acanthochites spiculosus astriger*, Reeve: Wissel, Zool. Jahrb., Syst., xx, 612, pl. 21, f. 25; pl. 23, f. 26, 27 (anatomy); not of Reeve. *A. bisulcatus*, Pilsbry: Wissel, *t.c.*, 614, pl. 23, f. 28, 29 (anatomy), not of Pilsbry.

Shell elongated, moderately elevated, hardly carinated; greenish, grey, or yellowish. *Anterior valve* finely granulose, apex smooth, sometimes carinated and beaked. *Intermediate valves* more or less distinctly beaked; latero-pleural areas covered with closely crowded, ovate, flattened granules; dorsal areas narrowly triangular, closely and finely striated longitudinally. *Posterior valve* with the tegmentum small, transversely oval, decidedly wider than long. *Girdle* rather narrow, greenish or yellowish, covered with short spicules, having a marginal fringe of longer spicules, and 18 tufts of light-blue or white bristles. *Colour* brown, greenish, grey, or yellowish, sometimes dotted with brown, some valves with a brown or black line at the summit, margined with white. *Interior* dark blue-green or dark grey; anterior valve with 5 not deep slits, teeth broad and sharp; intermediate valves with a small posterior slit; posterior valve with the post-median sinus shallow, insertion plate biangular behind, 1 small slit on each side, the edge between them often minutely crenulated; sinus wide,

minutely crenulated, squarish; sutural laminæ low, flatly convex; the tegmentum overreaching the articulamentum posteriorly.

Length, 28 mm.; breadth, 12 mm. Divergence, 105°.

Dentition.—Hutton, T.N.Z.I., xv, 129, pl. 16, f. G.

Type, from the French Pass, in Mus. Hist. Nat., Paris.

Hab.—Found almost everywhere along the coasts of New Zealand; more common in the south. Not found outside New Zealand waters.

Remarks.—The largest and finest specimens I found in Dunedin Harbour. Very variable in colour.

Fossil in the Pliocene.

Sect. 2. Cryptoconchus, Blainville and Guilding, 1829.

Cryptoconchus (Blainville MS. in Brit. Mus.), Guilding, Zool. Journ., v, 1829, 28. Type: *C. porosus*, Burrow.

Valves entirely covered by the girdle, except a linear area at the ridge of each. Posterior valve having the insertion plate with several (5–7) slits, anterior valve with 5 slits. Girdle leathery, naked, bearing a series (18) of sutural tufts on tubercles or pores, sometimes subobsolete, along the sides of the valves. Gills extending along the posterior half of the foot. (Pilsbry.)

Only two species of this section are known—the type from New Zealand, and a species from the coast of Florida.

2. **Acanthochites porosus**, Burrow, 1815. Plate 2, fig. 10; Plate 4, fig. 2.

Chiton porosus, Burrow, "Elements of Conchology," 189, pl. 28, f. 1. *Acanthochites porosus*, Man. Conch. (1), xv, 36, pl. 3, f. 57–62; P. Mal. S., ii, 193. *Chiton monticularis*, Q. & G., Voy. Astrol., iii, 406, pl. 73, f. 30–35. *C. Leachi*, Blainv., Dict. Sci. Nat., xxxvi, 554. *? Cryptoplax depressus*, Blainv., *l.c.*, xii, 124. *? Cryptoconchus Stewartianus*, Rochebr., Bull. Soc. Philom. Paris, 1881–82, 194. *C. zealandicus*, Quoy: Hutton, T.N.Z.I., iv, 183, not Q. & G. *C. porosus*, Burrow: Plate, Zool. Jahrb., v, 319; Wissel, *op. cit.*, xx, 618 (anatomy).

Shell elongated, all but a linear dorsal area of each valve covered by the integument continued upward from the girdle, but in the dried state showing through it the posterior outline of the valves; colour olive. *Head valve* with a minute circular exposed apex, centre longitudinally grooved, a few concentric flat ridges around it, cut up more or less into flat granules. *Intermediate valves* with the tegmentum reduced to a narrow flat ledge, drawn out to a long and fine point anteriorly; pleural areas consisting of elongate narrow triangular and flatly nodulous ridges, terminating at the middle of the jugum. The *posterior valve* shows a similar sculpture to that of the central valves, but it is very short and wedge-shaped. *Girdle* naked, smooth, leathery; bearing a series of prominent tubercles, each with a tuft of short

bristles, situated near the sutures upon the sides of the valves, and 4 around the anterior valve. *Colour* of the exposed portions of valves yellowish-white ; girdle olive, often beautifully variegated with orange and light brown ; blackish-brown in dried condition. *Interior* bluish-white ; anterior valve with 5 slits, all except the median slit inconspicuous, the upper surface radiately strongly striated ; intermediate valves with 1 minute slit on each side, posterior margin produced backward into 2 rounded lobes ; posterior valve with 2 well-marked side slits, between them 2–5 minor ones, the upper surface radiately rugosely striate ; sinus narrow, sharp, and smooth ; the sutural laminæ high, triangularly rounded ; valve-callus broad, strong.

Length, 38 mm. ; breadth, 20 mm. (Q. & G.)

Dentition.—Hutton, T.N.Z.I., xv, 129, pl. 16, f. H.

Type in the British Museum.

Hab.—Coasts of the North and South Islands ; in 15 fathoms near Stewart Island ; on rocks and under stones near low-water mark in sheltered situations.

Remarks.—This species grows to a larger size than the measurement given by Q. & G. ; the specimens from deeper water are small. I have not seen any specimens from the west coasts. It is by no means common.

Maori.—Karimoan (*fide* Quoy and Gaimard).

Sect. 3. Loboplax, Pilsbry, 1893.

Loboplax, Pilsbry, Man. Conch. (1), xv, 8, 38. Type : *Acanthochites violaceus*, Q. & G. *Phacellopleura*, Cpr. MS. ; not *Phakellopleura*, Guilding.

Valves partly covered, the anterior valve having 5 radiating ribs and the same number of lobes along the margin ; the posterior valve having the insertion plate grooved outside, notched and slit along the edge, between the usual postero-lateral slits. Girdle leathery, having minute sutural tufts. Gills (of *violaceus*) extending along the posterior two-thirds of the foot. (Pilsbry.)

The number of species belonging to this section is small ; three species belong to New Zealand, four to Australia, and one to New Caledonia.

3. Acanthochites Mariæ, Webster, 1908. Plate 4, fig. 3.

Acanthochites Mariæ, Webster, T.N.Z.I., xl, 1907 (1908), 254, pl. 20, f. 1–11.

Shell elongated, elevated, dorsal angle about 110°. *Colour* greenish-grey, minutely freckled with dark. Latero-pleural areas crowded with flattened granules, strap-shaped or oval, as in *A. zelandicus*, all the valves being bordered with irregular, raised, white, pebble-like granules of the same type as those in *A. violaceus*, with which this species also

agrees in having 5 prominent lobes on the anterior valve, the ribs being of white raised elongated granules, the ribs of all valves similarly marked ; another characteristic feature is the presence of 3 almond-shaped white granules just within the posterior edge of each median valve. Dorsal areas wedge-shaped, the edges being serrated, sculptured with cuneiform lyrulæ. The *posterior valve* has the tegmentum longer than the breadth, the hooked mucro being slightly post-median ; the area behind it is concave, white, composed of oblong granules, bordered on either side by others of longer form but the same colour. *Anterior valve* with 5 slits corresponding to the ribs ; median valves with 1 slit ; posterior with many slits, the denticles being mostly bifid. In the type these denticles are perpendicular, and not visible from above ; in other specimens they extend outwards, and may be seen beyond the tegmentum ; in such specimens the mucro is not so prominent, the white area narrower, and composed of long granules like those bordering the oblong granules of the type, these latter being altogether absent, as also are the raised white borders of the valves. It may be that these specimens have not attained their full development, as none of them approach the type in size. *Interior* blue-green, white towards the edges. *Girdle* grey-green, leathery, a minute pore at each suture, 4 on anterior valve. (Webster.)

Length of dried specimen, 35 mm. ; width, 18 mm.

Type in Mr. Webster's collection.

Hab.—Orua Bay, Manukau Harbour, on rocks at low tide ; Manukau Harbour, in 4 fathoms (Captain Bollons).

Remarks.—The type is unique ; seven of the less-developed specimens were found. The apparent hybridism is striking, especially as I have never found *A. violaceus* on the west coast, though a very small form of *A. zelandicus* is fairly common. (Webster.)

4. Acanthochites rubiginosus, Hutton, 1872. Plate 4, fig. 4.

Tonicia rubiginosa, Hutt., T.N.Z.I., iv, 1871 (1872), 180. *Acanthochites rubiginosus*, Hutt., J. Mal., xii, 68, pl. 9, f. 12–17. *A. costatus*, Ad. & Ang. : Suter., P. Mal. S., ii, 194, not Ad. & Ang. *Plaxiphora terminalis*, Smith : Wissel, Zool. Jahrb., xx, 609, pl. 21, f. 22 ; pl. 23, f. 23, 24 (anatomy) ; not of Smith.

Shell oblong, small, subcarinate, the whole surface granular, mostly yellowish-pink, girdle with minute spines and sutural tufts. *Anterior valve* with 5 ribs, which are not very conspicuous ; the whole surface granulated, the granules being largest and sometimes unequal in shape near the margin, and decreasing in size toward the apex of the valve, which is slightly sinuated. *Intermediate valves* with the jugum sparsely longitudinally substriated ; the pleural tracts are granular, divided into central and lateral areas by a low granular rib, the granules pebble-like near the margin, diminishing in size very rapidly toward the

jugum ; the valves are subcarinate and beaked. *Posterior valve* small, the mucro central, with a smooth triangular area in front, beyond which the whole surface is granular, the granules being comparatively large. *Girdle* thick, fleshy, beset with microscopic white spicules ; there are sutural tufts of white spicules, 7 on each side, and 4 in front of the head valve. *Colour* very variable, adult specimens showing mostly a pinkish colour, yellowish on the back, but young shells have sometimes a most beautiful colour-arrangement, the granules being white, pink, light brown, and light blue. The jugum is mostly reddish-brown with triangular spots. The girdle is light fulvous with small patches and radiate bands of whitish-yellow. *Interior* white, but the centre of the valves except the head valve is pink ; anterior valve with 5 slits, intermediate valves with 1 slit on each side, teeth strong ; posterior valve with a low thick insertion plate and 4 short slits ; sinus rather narrow and deep ; sutural laminæ short and wide, rounded ; valve-callus stout.

Length, 17 mm. ; breadth, 13 mm. Divergence, 100–105°.

Type in the Dominion Museum, Wellington. No locality mentioned.

Hab.—Cook Strait ; Foveaux Strait, in 15 fathoms ; Hauraki Gulf, in 25 fathoms ; Auckland Islands (Captain Bollons) ; Bluff ; Queen Charlotte Sound, in 6 fathoms (Captain Bollons).

5. **Acanthochites violaceus,** Quoy and Gaimard, 1835. Plate 2, fig. 11 ; Plate 4, fig. 5.

Chiton violaceus, Q. & G., Voy. Astrol., iii, 403, pl. 73, f. 15–20. *Acanthochites violaceus*, Q. & G., Man. Conch. (1), xv, 39, pl. 3, f. 67–73 ; P. Mal. S., ii, 193. *Chiton porphyreticus*, Reeve, Conch. Icon., pl. 10, f. 56. *Acanthochites violaceus*, Q. & G. : Plate, Zool. Jahrb., v, 315 : Wissel, *op. cit.*, xx, 616, pl. 21, f. 30 ; pl. 23, f. 31, 32 (anatomy).

Shell elongated, rather depressed ; the valves all of the same width, except the last, which is narrower ; colour purple-brown ; girdle very wide, but narrower behind. *Anterior valve* having 5 prominently projecting lobes, corresponding to radiating rounded ribs, the scale granules of the surface coalescing more or less on these ribs. *Intermediate valves* having the tegmentum trilobate, much narrowed in front, convex, polished, sculptured with elongated punctures along the sides ; latero-pleural areas sculptured with pebble-like low granules, coarser and often confluent along a diagonal line from the beak to the outer anterior angle. *Posterior valve* having the tegmentum slightly broader than long, the mucro low, slightly post-median. *Girdle* wide, leathery, smooth except for a minute pore at each suture and 4 around the head valve, each pore bearing a small tuft of white spicules, usually broken short. *Colour* typically a rich dark purple-brown, the girdle darker, varying to violet, with a buff triangle at the ridge of each

valve, enclosing a purple stripe or series of spots; sometimes ashy-whitish, faintly tinged with purple along the middle. *Interior* light blue-green, fading on the sutural laminæ; anterior valve with 5 slits, median valves with 1 slit; posterior valve having a deep mopaloid slit on each side, and about 4 shallower slits between; the teeth vertical, deeply grooved outside and lobed at the edge; sinus deep, angular. (Pilsbry.)

Measurement of a large example: Length, 60 mm.; breadth, 35 mm. A common size is—Length, 35 mm.; breadth, 23 mm. Divergence, 130–140°.

Type, from Tasman Bay, in Mus. Hist. Nat., Paris.

Hab.—Bay of Islands, Hauraki Gulf, Great Barrier Island, Cook Strait, Wellington Harbour, Cape Egmont, Dunedin, and Chatham Islands.

Remarks.—There is a wide range of variation in colouring, angle of divergence of the valves, and to a less extent in the contours of the valves

Maori.—Etouani (*fide* Quoy and Gaimard).

Genus 2. Spongiochiton, Carpenter, 1873.

Spongiochiton, Carpenter, "Table of Regular Chitons," 1873. Type and only species: *S. productus*, Cpr. *Spongiochiton*, Dall, Proc. U.S. Nat. Mus., 1882, 272, 283, 286, 289, 290; Man. Conch. (1), xiv, 26; xv, 7.

Valves partly immersed; insertion plates acute, ischnoid; sinus large, smooth; mucro median, flat; girdle spongy, produced forward. (Cpr.)

1. Spongiochiton productus, Pilsbry, 1892.

Spongiochiton productus, Pilsbry, Man. Conch. (1), xiv, 26.

Shell oval, the valves immersed two-fifths of their width; exposed portion rubicund, flat, the jugum arcuate, paler. Lateral areas scarcely defined. Entire surface sculptured with prominent pebbles, worn at the jugum. Mucro submedian, flat. *Interior:* Posterior valve with 6, central valve 1, anterior valve 5 slits; teeth long, acute, scarcely serrate; sinus wide, smooth, extremely deep; eaves narrow, scarcely grooved. *Girdle* produced in front, spongy, sparsely covered with chaffy scales and translucent hairlets.

Length, 25 mm.; breadth, $16\frac{1}{4}$ mm. Divergence, 130°. (Cpr.)

Type in the British Museum (Cuming collection, No. 50).

Hab.—New Zealand.

Remarks.—I have not seen it. The species was described by Carpenter in MS., and published by Pilsbry.

Suborder 3. TELEOPLACOPHORA, Pilsbry.

All the valves, or at least the 7 anterior, with insertion plates cut into teeth by slits.

Fam. **CHITONIDÆ**, Pilsbry.

Characters of the suborder.

Subfam. 1. CHITONINÆ.

Chitoninæ, Man. Conch. (1), xiv, 148.

Regular *Chitons*, having the insertion plates well developed on all the valves, and closely grooved or pectinated outside and at edge.

Genus 1. Chiton, Linnæus, 1758.

Chiton, L., Syst. Nat., ed. x, 667. First recognisable species: *C. tuberculatus*, L. *Chiton*, Man. Conch. (1), xiv, 149; xv, 88. *Lophyrus* (in part), Poli, Test. utr. Sicil., i, 2. 4. *Lepidopleurus* (in part), Risso, Hist. Nat. Eur. Mérid., 267. *Gymnoplax*, Gray, London Medic. Repos., xv, 234. (For genera established by Thiele, see Man. Conch., xv, 88.)

Valves wholly external, the beak of the tail valve median or anterior; insertion plates longer than the eaves, slit into teeth which are deeply and finely pectinated, and typically project outward on all the valves. Girdle covered with closely imbricating, convex, smooth or striated scales. Gills extending the entire length of the foot.

Distribution.—World-wide.

Key to Species.

a. Central areas having longitudinal riblets.
  b. Sides and ridge of central areas both sculptured.
    c. Lateral areas with numerous slightly crenulated threads.
      d. Intermediate valves carinated, divergence 120° — *Quoyi.*
    cc. Lateral areas with 3 or 4 rows of distinct tubercles.. — *pellisserpentis.*
  bb. Central areas with a smooth band or triangle on ridge of each valve.
    c. Lateral areas with 4–6, pleura with 16 or more, granose riblets .. .. — *canaliculatus.*
    cc. Lateral areas with 4–8 divaricate riblets, pleura about 20 furrows on each side.
      d. Furrows on pleura extended over the whole length .. .. — *Huttoni.*
      dd. Furrows on pleura extended only over half of the length .. .. — *æreus.*
    ccc. Lateral areas with 2–4, plenra 8–14, nodulose riblets.
      d. Girdle-scales mucronated .. .. .. — *limans.*
      dd. Girdle-scales not mucronated, faintly striated — *Stangeri.*
      ddd. Girdle-scales not mucronated, quite smooth — *clavatus.*

aa. Central areas smooth ; no longitudinal ribs.
b. Lateral areas with radiate granose ribs .. .. *Sinclairi.*
bb. Lateral areas without radiate ribs .. .. .. *Torri.*

a. Group of Chiton pellisserpentis.

Central areas with rather fine longitudinal sculpture, or smooth.

1. **Chiton pellisserpentis,** Quoy and Gaimard, 1835. Plate 2, fig. 12; Plate 4, fig. 6.

Chiton pellisserpentis, Q. & G., Voy. Astrol., iii, 381, pl. 74, f. 17–22 ; Man. Conch. (1), xiv, 173, pl. 37, f. 14–17 ; P. Mal. S., ii, 195. *C. squamosus,* L. : Wissel, Zool. Jahrb., xx, 619, not of Linné (anatomy).

Shell oval, rather elevated, side slopes somewhat convex, olive or brown, marked with black along the ridge. *Anterior valve* larger and much more elevated than the posterior, with numerous regular rows of distinct tubercles, the rows sometimes increased by splitting, interspaces finely decussate. Of the *intermediate valves,* the first is larger longitudinally than the others, central areas with strong irregular growth-lines, and fine longitudinal riblets ; these are broader in front, stouter near the margins, extending over the jugum on the first valve, but usually leaving the ridge smooth on the following 5 valves ; lateral areas moderately raised, with 3 or 4 rows of distinct tubercles of various form, interstices minutely decussate. *Posterior valve* small, with regular rows of tubercles, depressed, mucro in front of the middle, low, posterior slope almost straight. *Girdle* moderately wide, banded with darker and lighter ; scales rather large and wide, convex, often subcarinated in the middle, microscopically very finely striated. *Colour* usually dull, dingy-olive or olive-green marked with black on the ridge and on the sides of the valves. Sometimes 2 or more valves are light grey, the others greenish or dark brown, rarely the ground-colour is orange ; one specimen I have is beautifully bluish-green marked with white ; the girdle is always of the same colour as the valves, but lighter. *Interior* blue, indistinctly blotched with olive-green ; anterior valve having 12, central valves 1, posterior valve 12 slits ; teeth blunt, pectinated ; sinus broad and deep, smooth or hardly denticulate ; sutural plates rounded ; valve-callus heavy and smooth ; eaves broad.

Length, 30 mm. ; breadth, 23 mm. Divergence, 95–120°.

Dentition.—Hutton, T.N.Z.I., xv, 129, pl. 16, f. 1.

Type, from Tasman Bay, in Mus. Hist. Nat., Paris.

Hab.—Throughout New Zealand the most abundant *Chiton ;* Chatham Islands. Tasmania.

Remarks.—Its sculpture is frequently obscured or lost by erosion. A specimen with 5 valves only is recorded by Iredale (T.N.Z.I., xl, 375, pl. 31, f. 2).

Fossil in the Pliocene.

2. **Chiton Quoyi**, Deshayes, 1836. Plate 2, fig. 13.

Chiton Quoyi, Desh., in Lamarck, A.s.V., vii, 509; Man. Conch. (1), xiv, 172, pl. 37, f. 6–8; P. Mal. S., ii, 194. *C. viridis*, Q. & G., Voy. Astrol., iii, 383, pl. 74, f. 23–28, not of Spengler. *C. glaucus*, Gray: Hutton, M.N.Z.M., 112. *C. Quoyi*, Desh.: Wissel, Zool. Jahrb., xx, 620, pl. 28, f. 33–37 (anatomy).

Shell oval, rather elevated, carinated, side slopes straight, surface very finely striated, colour usually dark yellowish-green. *Anterior valve* with numerous narrow, delicate, slightly crenulated, and occasionally bifurcated radiating threads. *Intermediate valves* have the first longer than the succeeding valves, all slightly beaked; central areas very finely, obliquely longitudinally striated, the striæ extending over the jugum; the lateral areas slightly raised, with radiate riblets similar to those on the head valve. *Posterior valve* of about the same size as the anterior; central area with fine longitudinal and posterior with fine radiate threads; mucro a little in front of the middle, the posterior slope straight. *Girdle* with smooth, convex, imbricating scales, shining and of about equal size. *Colour* generally very dark olive-green, but sometimes yellowish-brown marked with olive on the sides and ends, or clear yellow with rays of olive or brown; uniformly reddish-brown examples occur; girdle mostly light blue, often with dark-brown scales mingled with the others. *Interior* light blue, the sutural laminæ white; anterior valve with 9, seldom 10, slits; median valves with 1 slit on each side; posterior valve with 13–14 slits; teeth sharp, minutely pectinate; sinus very broad, denticulate; sutural laminæ low, rounded; valve-callus strong, dark green.

Length, 37 mm.; breadth, 22 mm. Divergence, 110–120°.

Dentition.—Hutton, T.N.Z.I., xv, 129, pl. 16, f. F.

Type.—Mus. Hist. Nat., Geneva.

Hab.—Common throughout New Zealand; under stones between tide-marks.

Subsp. **limosus**, Suter, 1905.

Chiton Quoyi, Desh., subsp. *limosus*, Suter, J. Mal., xii, 69. *Chiton æreus*, Reeve: Suter, P. Mal. S., ii, 195, not of Reeve.

It differs from the species in being smaller and narrower, the ridge generally less acute, colour mostly obscured by a black coating. The anterior valve has only 8 slits, the tail valve 15; the sinus is broader; the sutural laminæ slightly higher and much narrower.

Length, 20 mm.; breadth, 12 mm. Divergence, 95–100°.

Type in my collection.

Hab.—Manukau and Auckland Harbours, on mud-flats, under stones between tide-marks; Lyall Bay.

3. Chiton Sinclairi, Gray, 1843. Plate 2, fig. 14; Plate 4, fig. 7.

Chiton Sinclairi, Gray, in Dieff. N.Z., ii, 263: Man. Conch. (1), xiv, 174, pl. 36, f. 1–3; P. Mal. S., ii, 196; Wissel, Zool. Jahrb., xx, 627, pl. 23, f. 38–44; pl. 24, f. 45–48 (anatomy).

Shell oval, rather elevated, the dorsal ridge rounded, side slopes rather straight, brown-black, irregularly striped with white. *Anterior valve* with 15–18 granose ribs, through splitting increased to 24–30 in adult specimens; a number of higher ridges near the anterior margin. *Intermediate valves* with the central areas smooth in the middle except for a few growth-wrinkles, but having fine short longitudinal riblets at the sides in front of the diagonal line; these, however, are sometimes absent; lateral areas raised, with 3–4 radiate granose ribs, often indistinct. *Posterior valve* with the central area smooth, posterior area with 10–14 strongly granose ribs, some of them occasionally bifurcate; mucro obtuse, in front of the middle. *Girdle* with imbricating, broadly rounded, and shining scales, which are microscopically very finely ridged. *Colour* brown-black, each valve irregularly and raggedly striped with whitish, the head valve rarely pale with dark rays; sometimes the white predominates; girdle banded with light blue and black, the inner rows of scales mostly light brown. *Interior* brownish-blue; anterior valve with 10–13 slits, intermediate valves with 1 slit on each side, posterior valve with 13 (rarely with 14) slits; teeth obtuse, very strongly crenulated; sinus broad, distinctly denticulate; sutural laminæ low, very broadly convex, straight, or with a shallow concavity in the middle, white with a brown spot at the base; valve-callus strong, brownish; eaves broad, spongy.

Length, 28 mm.; breadth, 18 mm. Other specimens are—30 mm. by 16 mm.; 19 mm. by 12 mm.

Type in the British Museum.

Hab.—Both Islands, but rather local, and not common; under stones between tide-marks: Chatham Islands.

Remarks.—The species has been recorded from Tasmania, but incorrectly. The short longitudinal riblets in front of the lateral areas are sometimes cut up into granules by strong growth-lines. Specimens are very often much eroded.

4. Chiton Torri, Suter, 1907. Plate 4, fig. 8.

Chiton Torri, Suter, P. Mal. S., vii, 295, f. 2 in text.

Shell small, elongate, smooth, dark brown. *Anterior valve* with 11 indistinct riblets (obsolete in one specimen), crossed by fine growth-lines, the whole surface minutely wrinkled. Of the *intermediate valves*, the first is twice as long as the others, broadly rounded and smooth, beaked, the central areas with minute transverse zigzag wrinkles, jugum smooth; lateral areas slightly raised, with concentric ridges, very distinct near the margin, but gradually disappearing towards

the centre, the whole minutely wrinkled. *Posterior valve* with a few concentric ridges near the margin, surface wrinkled as on the other valves, mucro central, low, posterior slope strongly convex. *Girdle* with small, rounded, smooth, and imbricating scales. *Colour* dark brown, somewhat lighter on the central and lateral areas; girdle darker, almost black. *Interior* light brown; anterior valve with 11 slits and intermediate valves with 1 slit on each side, posterior valve with a low insertion plate and 12 slits; teeth thick and blunt, with 1 or 2 grooves outside; sinus microscopically denticulate; sutural laminæ moderately high and broadly rounded.

Length, 9 mm.; breadth, 4·5 mm. Divergence, 100°.

Type in my collection.

Hab.—Bluff, South Island; type (Dr. Torr).

Remark.—This species stands nearest to *C. Sinclairi*, but is easily distinguished by its almost total smoothness and the microscopic wrinkles.

b. Group of Chiton canaliculatus.

Central areas with stout longitudinal ribs and comparatively deep grooves.

5. **Chiton æreus,** Reeve, 1847. Plate 2, fig. 15; Plate 4, fig. 9.

Chiton æreus, Reeve, Conch. Icon., pl. 7, f. 36; Man. Conch. (1), xiv, 179, pl. 36, f. 96, 97; Ereb. & Ter., pl. 1, f. 9; J. Mal., xii, 70; T.N.Z.I., xl, 376.

Shell oblong-ovate, angularly raised in the middle, valves rudely impressly striated; colour greenish, red, or yellowish-white. *Anterior valve* with 20–30 but slightly nodulose radiate riblets, crossed by fine concentric lines of growth. *Intermediate valves* with the jugum sharply angled, smooth, microscopically shagreened, the central areas with about 20 furrows on each side, not deep, continuing until they are rubbed off in the middle; lateral areas slightly raised, with 3 to 4 divaricating riblets, broken up by the concentric rugæ of growth, smoothish; crenate at the sutures. *Posterior valve* with 15 to 20 radiate riblets extending from the mucro to the posterior margin, shorter ones between them; riblets cut up into distinct oval granules by concentric lines of growth; central area longitudinally furrowed; mucro in front of the middle, pointed, posterior slope concave. *Girdle* with imbricating roundish and rather large scales, the rows on the inner and outer margins have smaller scales; they are microscopically finely striate. *Colour* dull green, clouded with black on the sides, sometimes brick-red, with or without faint black or brown patches on the sides of the central valves; rarely yellowish-white, sometimes beautifully marked with greenish zigzag bands, especially upon the lateral areas; girdle mostly irregularly banded with white; quite white specimens have the girdle dark brown. *Interior* light blue, with the sutural laminæ white; anterior valve with 10, intermediate valves

with 1 on each side, and posterior valve with 10 slits, which are close together in the centre, wide apart on the sides ; the slits are not deep ; the teeth blunt, strongly pectinate ; sinus narrow and deep, denticulate ; sutural laminæ low, very broad, and flatly convex ; valve-callus fairly strong, deep blue.

Length, 39 mm. ; breadth, 23 mm. (type). The largest specimen I have seen was 46 mm. by 27 mm. Divergence, 94° (type) ; with the specimens in my collection it varies from 108° to 115°, but in most examples is 110°.

Type in the British Museum.

Hab.—Throughout New Zealand, and a variety at the Auckland Islands ; rather local and not common : Hauraki Gulf (H. S.) ; Cape Egmont (R. Murdoch) ; Queen Charlotte Sound, in 6 fathoms (Captain Bollons) ; Russell (W. H. Webster) ; Cook Strait (Miss Mestayer) ; Lyttelton Harbour and Cape Saunders, Otago (T. Iredale) ; Shag Point and Bluff (Dr. Torr) ; Auckland Islands (Captain Bollons).

Remarks.—Red-coloured specimens are known from Hauraki Gulf and Cook Strait ; the white varieties are from the Bluff and Cape Saunders. The only specimen from the Auckland Islands is brownish-red ; the central areas are not shagreened, and more of the outer furrows extend the whole length than is usually the case.

6. **Chiton canaliculatus,** Quoy and Gaimard, 1835. Plate 2, fig. 16 ; Plate 4, fig. 10.

Chiton canaliculatus, Q. & G., Voy. Astrol., iii, 1835, 394, pl. 75, f. 37–42 ; Man. Conch. (1), xiv, 177, pl. 36, f. 4–6 ; P. Mal. S., ii, 196. *C. Stangeri,* Reeve : Pilsbry, Man. Conch. (1), xiv, 177, not of Reeve. *C. insculptus,* A. Adams, P.Z.S., 1852 (1854), 91, pl. 16, f. 4 : Wissel, Zool. Jahrb., xx, 655, pl. 21, f. 59–62 ; pl. 24, f. 63 (anatomy).

Shell small, oblong, strongly elevated, carinated, side slopes straight, steep, pink, sometimes with black spots along the ridge. *Anterior valve* with 20 to 22 flatly nodulous ribs, some of them bifurcate, posterior margin crenulate, apex smooth, slightly sinuate. *Intermediate valves* beaked, the jugum with a narrow smooth space, sides with about 16 strong longitudinal ribs, more slender near the centre, with deep narrow grooves between them ; lateral areas considerably raised, with 3 mostly bifurcating radiating ribs, which are cut up into low nodules by regular concentric lines ; posterior margins of valves strongly crenulated. *Posterior valve* with 12 to 16 granose radiating ribs, central area longitudinally costate ; mucro small, sharply pointed slightly in front of the middle, posterior slope a little concave. *Girdle* with compactly imbricating scales, which are small, convex, shining, and faintly microscopically striated. *Colour* of end valves and lateral areas pink, central areas yellowish, dorsal ridge pink with an olive-green or black stripe on each side ; sometimes olivaceous, or olive and rose. *Interior* whitish, microscopically punctate ; anterior valve with 9 (sometimes only 8) slits, intermediate valves with 1 slit on each

side, and posterior valve with 10 (rarely 9) slits; teeth minutely pectinated; sinus deep and narrow, denticulate; sutural laminæ very broadly convex; valve-callus not very stout; eaves solid.

Length, 14 mm.; breadth, 11 mm. Divergence, 100–105°.

Type in Mus. Hist. Nat., Paris.

Hab.—Tasman Bay, type (Q. & G.); Cook Strait; Dunedin; Foveaux Strait; Stewart Island. In deep water, on oysters or dead shells.

Remark.—The type of Adams's *C. insculptus* was collected in New Zealand by Strange.

7. Chiton clavatus, Suter, 1907. Plate 4, fig. 11.

Chiton clavatus, Suter, P. Mal. S., vii, 296, f. 3 in text.

Shell small, elongated oval, acutely raised, surface of all valves minutely shagreened, with nodulous sculpture; colour grey, some valves brown. *Anterior valve* with 8 radiate ribs, each consisting of 3 flatly convex nodules, the uppermost small and round, the following large and squarish, the lowest a little smaller, oblong; posterior margin crenulate. *Intermediate valves* have the first longer than the others, sharply angulate, slightly beaked; central areas with 5–6 deep longitudinal furrows on each side, centre smooth; lateral areas raised, with an anterior and posterior broad rib bearing flatly raised squarish nodules, which are more numerous on the posterior rib; seventh valve having a few central nodules on the lateral areas, marking a third rib; sutures strongly and bluntly crenulated. *Posterior valve* with 2 concentric rows of round nodules, representing 10 radiate ribs; mucro slightly in front of the middle, small and pointed, posterior slope straight. *Girdle* with rather large, imbricating, convex, and smooth scales, smaller on the inner side. *Colour* of the first, second, seventh, and eighth valves ash-grey, the other valves greyish-brown with white spots along the ridge; girdle uniformly grey. *Interior:* Anterior valve with 8, intermediate valves with 1, and posterior valve with 11 slits; teeth pectinate.

Length, 14 mm.; breadth, 9 mm. Divergence, 95°.

Type in my collection.

Hab.—Rangitoto Island, near Auckland, between tide-marks; a single specimen (H. S.).

Remarks.—Of the New Zealand species, *C. limans* is the nearest, from which, however, it is easily separated by the smooth not sharply raised tubercles, and the rounded not pointed smooth scales

8. Chiton Huttoni, Suter, 1906. Plate 2, fig. 17; Plate 4, fig. 12

Chiton Huttoni, Suter, T.N.Z.I., xxxviii, 320, pl. 18, f. 1–6.

Shell oblong-ovate, angularly raised, valves striated throughout, jugum smooth, girdle with rounded scales; colour yellowish-olive, dull to dark green or brick-red; interior whitish. *Anterior valve*

having 17 to 24 subequal riblets reaching to the apex, and broken up by concentric growth-lines into roundish granules; sometimes a few riblets are interspersed which do not extend to the apex; the latter is smooth, and slightly sinuate. *Intermediate valves* with the jugum smooth, slightly beaked; central areas with 20 to 25 longitudinal furrows on each side, narrower and less deep near the centre, but usually widening and deepening toward the margins; sometimes they are in breadth equal to the riblets, but in some specimens they are narrower; they extend the whole length of the areas. Lateral areas distinctly raised, with 3 to 5 strong nodulous ribs, which rarely bifurcate; sutures crenulate. *Posterior valve* with 18 to 20 strongly granose ribs; central area with longitudinal grooves; mucro slightly behind the middle, pointed, posterior slope concave. *Colour* mostly yellowish-olive or dull green with 1 valve blackish-green, rarely brownish-black or brick-red; girdle of the same colour as the valves, with white or darker bands. *Interior* bluish-white, pinkish-white in red specimens; head valve with 9, intermediate valves with 1, and tail valve with 15 slits; teeth blunt and pectinate; sinus deep and narrow, denticulate; sutural laminæ white, broad and low, median part of them nearly straight; valve-callus rather prominent.

Length, 34 mm.; breadth, 20 mm. Divergence, 115°.

Type in my collection.

Hab.—Near Dunedin (A. Hamilton); Banks Peninsula (T. Iredale).

9. **Chiton limans**, Sykes, 1896. Plate 2, fig. 18.

Chiton limans, Sykes, P. Mal. S., ii, 93; Suter, P. Mal. S., ii, 197; Carpenter, MS. *C. maricatus*, A. Adams, P.Z.S., 1852 (1854), 91, pl. 16, f. 6; Man. Conch. (1), xiv, 175, pl. 37, f. 12, 13, not Tilesius, 1824. *C. sulcatus*, Q. & G.: Hutton, T.N.Z.I., iv, 178, not Quoy and Gaimard.

Shell oval, elevated, the jugum acute; mucro median, subprominent; olivaceous, maculated with paler; entire surface minutely punctate. *Anterior valve* with 8 ribs bearing 3 high round nodules near the margin; apex smooth, sinuate; posterior margin strongly denticulate. *Intermediate valves* with 9 to 14 grooves on each side, jugum smooth; lateral areas with 2 riblets, sometimes bifurcating or with another intercalated, furnished with strong acute tubercles, interstices smooth; sutures denticulate. *Posterior valve* with 8 nearly obsolete radiate riblets, central area longitudinally grooved; mucro median, distinct, posterior slope strongly concave. *Girdle* with large and small wide, distinctly striated, elevated, acutely pointed scales. *Colour* olivaceous or greyish, maculated with white; girdle banded with bluish-green and white. *Interior:* Sinus moderate, with about 15 denticles; anterior valve having 8, central 1, posterior valve 9 slits; teeth pectinate.

Length, 23·75 mm.; breadth, 12·5 mm. Divergence, 100°.

Type in the British Museum.

Hab.—Cook Strait. The type was collected by Strange in Port Jackson, N.S.W.

Remarks.—There are two specimens from Kapiti Island in the Dominion Museum, and these are the only examples known to have been found in New Zealand waters.

10. **Chiton Stangeri**, Reeve, 1847. Plate 2, fig. 19; Plate 4, fig. 13.

Chiton Stangeri, Reeve, Conch. Icon., pl. 22, f. 150; P. Mal. S., ii, 196. Not *C. canaliculatus*, Q. & G., as suggested by Hutton, Man. Conch. (1). xiv, 177.

Shell small, ovate-oblong, elevated, sculpture rather coarse, whitish with green. *Anterior valve* with about 20 radiate nodulous ribs, apex smooth, microscopically shagreened, sinuated. *Intermediate valves* sharply angled, side slopes straight; central areas with the jugum smooth and shining, minutely shagreened; sides with 6 to 8 longitudinal grooves on each side, very narrow near the middle, broader toward the margins, ribs broad and smooth; lateral areas with 3 to 4 broad radiate ribs, cut up by regular growth-lines into squarish nodules. *Posterior valve* with about 20 nodulous riblets, central area smooth, a few grooves on each side; mucro in front of the middle, pointed, posterior slope concave. *Girdle* with imbricating, rounded, and convex scales, largest in the median rows, microscopically faintly striated. *Colour* yellowish-white, tesselated with green and grey spots; girdle banded with light blue, green, and white. *Interior* greyish-blue; sinus narrow, denticulate; sutural laminæ broadly rounded, white.

Length, 13 mm.; breadth, 8 mm. Divergence, 120°.

Type in the British Museum.

Hab.—The type was collected in New Zealand by Dr. Stanger, exact locality not stated. Lyttelton Harbour (H. S., T. Iredale); Hauraki Gulf (H. S.); Bay of Islands (J. C. Anderson).

Remark.—This is one of our very rare species.

Genus 2. Eudoxochiton, Shuttleworth, 1853.

Eudoxochiton, Shuttleworth, Berner Mittheilungen, 1853, 67. Type: *Acanthopleura nobilis*, Gray. *Acanthopleura*, sect. xx†, Gray, P.Z.S., 1847, 68, not Guilding. *Maugeria*, sect. †, Gray, Guide, 1857, 184. *Chætopleura*, Adams *et al.*, not Shuttleworth.

Valves entirely exposed, smoothish, lacking eyes; mucro flat, the sutural plates broad and connected across the sinus; insertion plates of all valves blunt, closely and deeply cleft; the median valves with 3 or 4, end valves with many, short slits. Girdle leathery, setose. Gills extending the entire length of the foot.

The valves, when eroded, are seen under the lens to be densely, evenly, and regularly punctured all over. The interior is white, and of a dense porcellanous texture. The laciniated insertion plates, cut into many short teeth, combined with the harshly setose girdle and continuous sutural plates, are the most striking generic characters. (Pilsbry.)

From *Acanthopleura* and *Mayerria* groups, to which some authors have referred the type of this genus, *Eudoxochiton* is sundered by the lack of eyes in the valves, the multiplicity of slits, depressed mucro, &c. (Pilsbry.)

This genus seems to be restricted to New Zealand. Pilsbry states that *C. linter*, Reeve, from the East Indies, may belong to this genus, but its generic characters are entirely unknown.

KEY TO SPECIES.

a. Shell elevated, divergence 100–110°, anterior valve with 30 slits, spinelets black .. .. *nobilis.*

aa. Shell depressed, divergence 135–140°, anterior valve with 17 slits, spinelets brown .. .. *Huttoni.*

1. **Eudoxochiton nobilis**, Gray, 1843. Plate 2, figs. 20, 25; Plate 4, fig. 14.

Acanthopleura nobilis, Gray, Dieff. N.Z., ii, 245. *Eudoxochiton nobilis*, Gray, Man. Conch. (1), xiv, 193, pl. 46, f. 88–95; Ereb. & Ter., pl. i, f. 8; P. Mal. S., ii, 197.

Shell oblong, elevated, the valves well arched, and very obtusely angular on the dorsal ridge, side slopes convex, smooth, dark brown. *Anterior valve* with about 15 indistinct low radiate ribs. *Intermediate valves* broadly A-shaped, not beaked, the central areas smooth except for very fine close growth-lines; lateral areas moderately raised, with 3–5 indistinct radiate ribs. *Posterior valve* elevated in front, the mucro flat, central; posterior margin gently emarginate behind. All valves microscopically punctured. *Girdle* leathery, rust-coloured, bearing short rigid black spinelets. *Colour* uniform dark brown, a little mottled toward the beaks and marked with scarlet there; girdle rusty-brown. *Interior* porcelain-white, immaculate, smooth and poreless; anterior valve having 30, median valves 3–4, tail valve 24–25 short slits; insertion plates with broad, blunt edges, irregularly and deeply pectinated; sutural plates squared, continuous across the sinus, which is indicated by a median bay or notch; eaves very narrow, deeply grooved along the teeth, and slightly spongy there.

Length, 60 mm.; breadth, 35 mm. Divergence, 100–110°. Other measurements are—75 mm. by 45 mm.; 110 mm. by 62 mm.; 123 mm. by 70 mm.

Type in the British Museum.

Hab.—East coasts of North and South Islands; on rocks or under boulders in exposed situations, sometimes together with *Plaxiphora biramosa* and *P. obtecta*. A rather rare shell.

2. **Eudoxochiton Huttoni**, Pilsbry, 1893. Plate 4, fig. 15.

Eudoxochiton Huttoni, Pilsbry, Man. Conch. (1), xiv, 194, pl. 46, f. 96–100.

Shell oval, depressed, with convex side slopes, brown, smooth, with microscopic punctulation. *Anterior valve* has no trace of radiate ribs, only very fine growth-lines. *Intermediate valves* broadly A-shaped,

not beaked, but with a low posterior keel on the jugum; central and lateral areas smooth, the latter a little raised, both with fine growth-lines. *Posterior valve* depressed, the mucro plane, central, posterior margin not emarginate. *Girdle* leathery, bearing numerous short, rigid, dark-brown spinelets. *Colour* dark brown; sometimes the dorsal area is light greenish, with irregular transverse bands of brown spots, the posterior part of each valve broadly and vividly pink-coloured; the girdle is in fresh specimens greyish-white with minute close brown dots, greenish-brown when dry. *Interior* white, smooth; anterior valve having 17, central 3, posterior 19 short slits; the insertion plates blunt, deeply pectinated; sutural plates continuous across the sinus, which is indicated by a shallow wave or bay.

Length, 50 mm.; breadth, 34 mm.: a spirit specimen in my collection has a length of 55 mm.; breadth, 44 mm. Divergence, 135–140°.

Type.—Mus. Acad. Nat. Sci., Philadelphia.

Hab.—North and South Islands; Little Barrier Island; Te Onepoto, near Lyttelton (H. S.); Stewart Island (Otago Museum). A very rare species.

Remarks.—It is closely allied to *E. nobilis*, from which it differs in the proportions of the valves, depressed form, fewer slits, &c.

Subfam. 2. TONICHNÆ.

Eyes developed on end valves and lateral areas; posterior valve not deeply sinused behind, its insertion plate developed. Girdle leathery, nude or nearly so.

Genus 3. TONICIA, Gray, 1847.

Tonicia, Gray, P.Z.S., 1847, 65, 67. Type: *Chiton elegans*, Frembly. *Tonicia*, Gray, Guide Syst. Dist. Moll. B.M., 1857, 185. *Lucia*, Gould (pre-occupied). *Lucilina*, Dall, 1881. *Toniciopsis* (in part), Thiele, "Das Gebiss der Schnecken," ii, 371. *Tonicia*, Gray, Man. Conch. (1), xiv, 149, 194; xv, 89.

Valves external, all having pectinated insertion teeth; sutural plates separated by a squared denticulate sinus; lateral areas and end valves bearing radiating rows or bands of eye-dots. Girdle leathery, naked or sparsely hairy. Gills extending the whole length of the foot.

The species of *Tonicia* inhabit mainly the shores of the southern and tropical Pacific, being found from middle America to Cape Horn, and from the Philippines to Australasia.

1. **Tonicia cuneata**, Suter, 1908. Plate 5, fig. 1.

Tonicia cuneata, Suter, T.N.Z.I., xl, 1907 (1908), 360, pl. 28, f. 1, 2.

Shell oblong-ovate, rather small, valves much raised, the intermediate valves beaked, angled above, with cuneiform sculpture.

Anterior valve with 4 low and smooth ridges with serrated margins, corresponding with the slits, anterior margin with the same number of slightly projecting lobes, posterior margin a little concave ; sculpture between the riblets consisting of deeply engraved grooves and punctures, leaving numerous wedge-shaped smooth patches of various size ; the whole surface dotted with minute eyes. Of the *intermediate valves*, the first is notably larger than the following 5, all are situated on the latero-anterior sides and narrowed, convex in front and prominently beaked behind ; dorsal area V-shaped, smooth, microscopically transversely finely striate ; pleural tracts with a few narrow longitudinal and divergent serrated grooves ; lateral areas not raised, with an anterior obtuse diagonal ridge, sculpture similar to that of the head valve ; the small reddish eyes scattered over the whole surface. *Posterior valve* with a V-shaped dorsal area, its sides serrated, mucro at about the posterior fourth, posterior slope moderately concave, posterior margin slightly lobed, the lobes corresponding with the slits, sculpture beautifully wedge-shaped, with the postero-lateral ridges corresponding with the anterior slits ; the whole surface covered with minute eyes. *Girdle* moderately broad, leathery, yellowish, almost naked, with very few silvery fine hairs near the margin. *Colour* a dirty-white ; anterior valve with the riblets reddish-white, the grooves and punctures rusty ; intermediate valves with the central area light olive, bordered by white, ornamented with very fine longitudinal reddish lines ; grooves on the pleural and lateral areas rusty, a few light-blue spots scattered over the areas ; posterior valve having the central area coloured as the intermediate valves, the grooves rusty, the cuneiform nodules on the pleural tracts light blue ; white, with a few blue spots, posteriorly. *Interior* greenish-white, without any strong callosity. Anterior valve with 4 slits, the 2 central ones broader ; intermediate valves with 1 slit on each side, and posterior valve with 7 inequidistant slits ; all teeth of the first 7 valves finely pectinated and sharp, but those of the tail valve are stout, deeply grooved, rather blunt-edged ; all insertion plates are high ; sinus flat, finely denticulate ; sutural laminæ angularly produced, rather thin ; valve-callus not much raised.

Length, 22 mm. ; breadth, 11 mm. (dry specimen). Divergence, 78°. Animal with the gills extending nearly the whole length of the foot.

Type in my collection.

Hab.—Bay of Islands (J. C. Anderson).

Remarks.—This shell is distinguished by its peculiar cuneiform sculpture from all the other species of the genus known to me. A curious feature of this species are the minute punctures scattered over the whole surface of all valves, not confined to the lateral areas only on the intermediate valves. I took them for eyes, but I may be wrong. I have only one specimen, and it is highly desirable that more examples should be obtained and carefully examined.

Genus 4. Acanthopleura, Guilding, 1835.

Acanthopleura, Guilding, Zool. Journ., v, 1835, 28 (in part). Type: *Chiton spinosus*, Brug. *Corephium*, Gray, P.Z.S., 1847, 65, 68; not Brown, 1827. *Maugeria*, Gray, Guide Brit. Mus., 1857, 183 (in part). *Francisia*, Carpenter, in Dall, Proc. U.S. Nat. Mus., 1881, 284, 289, 290 (1882).

Valves exposed, beaked, generally lustreless or eroded; provided with eyes on the forward part of the latreal areas and the end valves; mucro posterior; interior coloured, the tegmentum broadly inflexed at the posterior margin of each valve. Insertion plates all conspicuously pectinated outside and directed forward. Girdle thick, covered with small or large calcareous spines. (Pilsbry.)

A widely spread genus, being recorded from the West Indies, Strait of Magellan, west coast of South America, Galapagos, Tonga, Fiji, New Caledonia, north Australia, New Guinea, Java, Philippine Islands, Bismarck Archipelago, Mauritius, Réunion, Comoro Islands, Zanzibar, Cape of Good Hope, Cape Verde Islands, &c.

Subgen. 1. Maugeria, Gray, 1857.

Maugeria, Gray, Guide Syst. Dist. Moll. Brit. Mus., 183 (in part). Type: *Ch. granulatus*, Gmel. *Acanthopleura*, Carpenter, Table Reg. Chitons, 1873; not Guilding, *q.v.*

Exterior lustreless: tail valve having numerous (7–12) slits in the short crenulated insertion plate, median valves 1 slit, the exposed coating or tegmentum wider than the articulamentum, or inner layer; sinus not toothed, the sutural plates connected across it; girdle thick, densely beset with calcareous spinelets. (Pilsbry.)

1. **Acanthopleura granulata**, Gmelin, 1790. Plate 2, fig. 21; Plate 5, fig. 2.

Chiton granulatus, Gmel., Syst. Nat., ed. xiii, 3205. *Acanthopleura granulata*, Gmel., Man. Conch. (1), xiv, 227, pl. 50; J. Mal., xii, 70. *Chiton magellanicus*, Gmel. *C. piceus*, Gmel. *C. occidentalis*, Reeve. *C. salamander*, Spengler. *C. tuberculatus*, L.: Schröter, not Linnæus. *C. unguiculatus* et *convexus*, Blainville. *C. blauneri* et *mucronulatus*, Shuttleworth. *Tonicia corticata*, Hutton, T.N.Z.I., iv, 180.

Shell oblong, moderately elevated or roundly arched, almost always eroded, cinereous, girdle with calcareous spinelets. *Anterior valve* closely granulated, the granules diminishing in size toward the apex; interspaces with numerous small black eyes. *Intermediate valves* beaked, roundly arched, the jugum of the first median valve granulate, on the succeeding valves minutely wrinkled; lateral areas having the granules disposed in longitudinal rows in front of the lateral areas, which are but slightly raised, granose, and interspersed with numerous eyes. *Posterior valve* with a few growth-ridges, closely granulated, eyes less numerous; mucro swollen, posterior. *Girdle* thick and fleshy, densely covered with short unequal spinelets, which

are calcareous, and either black or white; the black spines are frequently longer and straight, the white spines short, mingled with a few much larger ones, shaped like the shell of *Cadulus*. *Colour* dull, ashy, or brown, generally with a patch of brown on the ridge of each valve, with a pair of whitish, buff, or pinkish stripes. *Interior* sea-green or lead-blue, fading to nearly white on the sutural plates; each median valve with a purple-black tract between the sinus and the summit of the callus, square or 2-branched at the ends, anterior valve having normally 8–10, central 1 (rarely 2), posterior valve 9 (occasionally 7–14) slits; teeth long and very deeply pectinated outside; teeth of tail valve short and obtuse, directed forward, very deeply pectinated outside and on the edge; sinus slightly concave, or convex and notched at the sides, not denticulate.

Length, 80 mm.; breadth, 46 mm. Divergence, about 125°.

Type (?).

Hab.—New Zealand. Pitt Island, Chathams.

Remark.—This is the common *Chiton* of the West Indies.

Subfam. 3. LIOLOPHURINÆ.

Median and anterior valves provided with eyes, and having well-developed insertion plates with slits, the teeth pectinated outside, not thickened at the edges of the slits. Posterior valve with the mucro posterior and terminal; its insertion plate obsolete, reduced to a low ridge or flat ledge of callus, which is unslit (except in *Schizochiton*) and continuous posteriorly or interrupted in the middle by a caudal sinus. Gills as long as the foot.

This group is closely allied to *Chitonidæ*, and has doubtless been derived from the Tonicioid branch of that stock. It is separated from them on account of the degeneration of the posterior valve, and especially of its insertion plate. (Pilsbry.)

Genus 5. Lorica, H. and A. Adams, 1852.

Lorica, H. and A. Adams, A.M.N.H. (2), ix, 355. Type: *L. volvox*, Reeve.

Valves exposed, not beaked, the lateral areas and end valves with many fine riblets or pustules. Eyes confined to a single series along the summit of each diagonal rib. Insertion plates blunt, obsoletely pectinated, the slits in head valve not corresponding to external ribs; sinus very small. Posterior valve having the mucro posterior and terminal, insertion plate unslit, obsolete, being reduced to a convex ridge of callus; posteriorly cleft to the mucro by a deep rounded sinus, or waved. Girdle slit or waved behind, densely scaly.

This is one of the few genera of "irregular" *Chitons* having a scaly girdle. The eyes seem to be nearly obsolete, and possibly are not functional, although they still are pigmented. In most speci-

mens a good hand-lens shows the series of ocular punctures along the diagonal ridge, immediately in front of the anterior row of pustules. (Pilbry.)

Australia and New Zealand only.

Sect. 1. Lorica, s. str.

Sinus in tail valve deep; jugal sinus V-shaped; girdle widest at the sides, cleft behind.

1. **Lorica volvox,** Reeve, 1847. Plate 2, fig. 22; Plate 5, figs. 3, *a*, *b*.

Chiton volvox, Reeve, Conch. Icon., Chiton, pl. 6, f. 31. *Lorica volvox*, Reeve, Man. Conch. (1), xiv, 237, pl. 52, f. 14–21; P. Mal. S., vii, 297. *C. cimolius*, Reeve, Conch. Icon., pl. 21, f. 141. *C.* (*Lepidopleurus*) *rudis*, Hutton, T.N.Z.I., iv, 1872, 179.

Shell oblong, strongly elevated, the dorsal ridge angular, side slopes nearly straight; surface lustreless, finely sculptured, variable in colour. *Anterior valve* strongly elevated, curving forward at the summit, the anterior slope being concave; sculptured with many radiating riblets, which are pustulose when not eroded. The *median valves* are not beaked even when young, but they are falsely beaked or narrowly projecting at the sinus in front; lateral areas raised, sculptured with 8–12 low radiating cords bearing rounded pustules, which are more or less entirely lost in adult specimens; central areas sculptured with numerous narrow raised threads parallel to the dorsal ridge, their interstices wider than the threads, and closely latticed across. *Posterior valve* small, much depressed, with posterior terminal elevated mucro; posterior lateral margin bounded by an elevated rib; posterior area extremely small, vertical, perpendicularly ribbed, having a deep rounded excavation behind. *Girdle* wide, bluish with inconspicuous dusky cross-bars, slit behind, its surface very densely covered with minute, closely imbricating, smooth, convex scales. *Colour* sometimes buff, with chestnut streaks and darker angular blotches on the central areas, fewer on the lateral areas; sometimes the lateral areas are olive-green, the dorsal region light, the sides of the central areas brown or olive. The dorsal ridge is sometimes stained with orange on each valve, and the same colour often clouds the sides also. *Interior* white; tegmentum reflexed and sculptured along the posterior margin of each valve; anterior valve having 8 slits, central 1 slit; the slits minute; teeth short, blunt, finely but obsoletely pectinated outside, and crenulated at the edge. Posterior valve having a low, rounded callus ridge in place of the insertion plate, its edge unslit, finely and rather obsoletely striated, interrupted by a deep rounded sinus in the middle behind; eaves narrow, solid; sutural plates broad, separated by an extremely small V-shaped sinus in the middle.

Length, 70 mm.; breadth, 38 mm. Divergence, about 90°; the young more depressed. (Pilsbry.)

Type in the British Museum; of *C. rudis*, Hutt., in the Dominion Museum, Wellington.

Hab.—Whale Rock buoy-moorings, 20 fathoms, one specimen (Captain Bollons); Channel Island, Hauraki Gulf, 25 fathoms, one intermediate valve; Dusky Sound, 30 fathoms (R. Henry). Australia.

Remark.—The specimen in the Dominion Museum, locality not stated, may now safely be considered as having been obtained somewhere in New Zealand.

Genus 6. Onithochiton, Gray, 1847.

Onithochiton, Gray, P.Z.S., 1847, 65, 68, 169. Type: *Chiton undulatus*, Q. & G.

Valves exposed, polished, beaked, with indistinct lateral areas; eyes present and disposed in a ray on the forward part of each lateral area and in numerous rays on the anterior valve. Interior porcellanous; sinus denticulate, angular; insertion plates pectinated outside, that of the first valve with 8 slits, median valves 1 slit; posterior valve depressed, triangular, with posterior terminal and marginal mucro, the insertion plate reduced to a low, smooth, and narrow callus. Girdle leathery, rendered velvety by very minute chaffy hairs. (Pilsbry.)

The species are distributed from the Cape of Good Hope to New Zealand.

Key to Species.

a. Lateral areas and anterior valve smooth or radially sculptured; central areas smooth.
  b. Lateral areas smooth or with 4 or 5 low subgranose riblets — *undulatus.*
  bb. Lateral areas closely sculptured with close subgranose striæ .. .. — *semisculptus.*
aa. Lateral areas having concentric sculpture; central areas or pleura with forwardly converging sulci .. .. — *nodosus.*

1. Onithochiton nodosus, Suter, 1907. Plate 5, fig. 4.

Onithochiton nodosus, Suter, P. Mal. S., vii, 297, f. 4 in text.

Shell small, elongately ovate, shining, flesh-colour, variegated with white and brown, lateral areas with nodulous ribs. *Anterior valve* with about 20 radiate nodulous riblets, crossed by 4 concentric furrows; about 14 radiate rows of minute silvery eyes. *Intermediate valves* slightly beaked, with the jugum sharply rounded; central areas minutely punctate, longitudinal sulci in front of the lateral areas, short near the centre, but extending nearly the whole length on approaching the margins; several transverse furrows extend over the central areas. Lateral areas scarcely raised, with 3 nodulous ribs, the 2 posterior ones close together; sutures slightly crenulated; one row of eyes between the first and second rib. *Posterior valve* with the mucro terminal, minutely punctate, a concentric marginal row of

nodules, interspersed with eyes. *Girdle* narrow, leathery, with narrow white stripes below the sutures. *Colour* light pink over the jugum, minutely dotted with white, margined by rows of triangular white spots; central and lateral areas reddish-brown, variegated with white on some of the intermediate valves. *Interior* reddish-brown; anterior valve with 10 irregularly spaced slits; teeth pectinate; intermediate valves with 1 slit on each side; posterior valve with a low, smooth, and rounded callus.

Length, 17 mm.; breadth, 7 mm. Divergence, 70°.

Type in the cabinet of Miss Mestayer, Wellington.

Hab.—Foveaux Strait, in 18 fathoms, one specimen (Captain Bollons), type; Guard's Bank, Pelorus Sound (Captain Bollons).

Remark.—This species is nearly allied to *O. rugulosus*, Angas, from Port Jackson, which, however, is much more depressed, the divergence being 125°. According to Thiele, this is *O. marmoratus*, Wissel, 1904: see Appendix.

2. **Onithochiton semisculptus**, Pilsbry, 1893. Plate 2, fig. 23.

Onithochiton semisculptus, Pilsbry. Man. Conch. (1), xiv, 247, pl. 55, f. 10, 11: J. Mal., xii, 71: Wissel, Zool. Jahrb., xx, 658, pl. 21, f. 64; pl. 24, f. 65, 66 (anatomy).

Shell oblong, elevated, subangular, olive-green, white and brown, concentrically banded and sometimes longitudinally striped. *Anterior valve* with numerous close radiate riblets, distinct near the margin; anterior half with small black eyes irregularly scattered about. *Intermediate valves* with a low keel on the jugum, beaked; central area smooth, shining; lateral areas slightly raised, indistinctly separated from the pleura, with fine and close radiate riblets, which are more or less distinctly granose, their number varying from about 12 to 20; front of each lateral area with a small number of eyes. *Posterior valve* convex, smooth; mucro terminal. *Girdle* rather broad, buff with numerous minute brown dots, brown when dry. *Colour* dark olive-green, with snowy angular lines and dots on the lateral areas, and closer more regular transverse lines on central areas; sometimes beautifully ornamented with white and brown longitudinal streaks of various width. *Interior* white or light blue; anterior valve with 8 slits, median valves with 1 slit, on each side; teeth very blunt and strongly pectinated; sinus rather broad, denticulate; sutural laminæ broadly rounded, slightly higher near the sinus.

Length, 27·5 mm.; breadth, 16 mm. (type): divergence, 95°. A specimen in my collection: Length, 46 mm.; breadth, 25 mm.

Type in Mus. Acad. Nat. Sci., Philadelphia.

Hab.—Chatham Islands (H. B. Kirk).

Remark.—It is distinguished from all other known species by the sculpture of the lateral areas.

3. Onithochiton undulatus, Quoy and Gaimard, 1835. Plate 2, fig. 24; Plate 5, fig. 5.

Chiton undulatus, Q. & G., Voy. Astrol., iii, 393, pl. 75, f. 19–24. *Onithochiton undulatus*, Q. & G., Man. Conch., xiv, 245, pl. 55, f. 14–16; P. Mal. S., ii, 199. *Tonicia lineolata*, Frembly: Hutton, M.N.Z.M., 114, not of Frembly.

Shell oblong, moderately elevated, the dorsal angle rounded, side slopes nearly straight, colour very variable, mostly olive with concentric brown lines. *Anterior valve* with obsolete radiating riblets, and rays of eyes, the eye-rays variable in number, width, and degree of coalescence, the individual eyes being very mutable in number and position. *Intermediate valves* beaked, central areas smooth and polished, lateral areas but little raised, and either smooth or sculptured with 4 or 5 low more or less obsolete beaded radiating riblets, and showing under a lens a band of eye-dots near the front margin. *Posterior valve* very shortly subtriangular, the distance from sinus to mucro being but little more than one-third the width of the valve's tegmentum. *Girdle* yellowish-white, with very minute brown dots. *Colour* extremely variable; various shades of green, yellowish on the ridge, or buff, flesh-colour, light blue, &c.; always with concentric darker lines, more distinct on the sides; sometimes the first 2 valves of a light pink, the others dark olive on the sides, yellowish-white in the middle, &c. *Interior* white or light blue, chestnut under the beak of each valve; anterior valve with 8 slits, intermediate valves with 1 slit, on each side; teeth obtuse, closely and sharply pectinated outside and on the summits; posterior valve with a narrow convex ridge; sinus deep, angular, finely denticulate; sutural laminae broad, higher toward the sinus.

Length, 25 mm.; breadth, 16 mm.: a large specimen, 30 mm. by 19 mm. Divergence, 110°.

Type in Mus. Hist. Nat., Paris.

Hab.—Throughout New Zealand and the Chatham Islands; under stones between tide-marks, and in kelp-roots.

Var. subantarcticus, Suter, 1907.

Onithochiton undulatus, Q. & G., var. *subantarcticus*, Suter. T.N.Z.I., xxxix, 1906 (1907), 268.

This colour variety is usually of uniform chocolate or purplish-brown colour, sometimes with white patches on the ridge, or, though very rarely, the second, the fifth, and sixth valves partly or entirely white with concentric lines of brown. One specimen I disarticulated had only 6 slits in the anterior valve, but others have the normal 8 slits.

Type, from the Auckland Islands, in my collection.

Hab.—Auckland and Campbell Islands, Cook Strait, and New Brighton, but rare.

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Class II. **PTEROPODA**, Cuvier.

Pelagic animals in which the mid-region of the foot in its primitive condition, is relatively largely developed, and drawn out into a pair of wing-like muscular lobes, which are used as paddles. The head is often rudimentary, but may be drawn out into one or more pairs of tentacles, simulating cephalic tentacles, and provided with suckers. The hind region is often aborted, but may carry an operculum.

The visceral hump is not twisted, except in the *Limacinidæ*. Jaws and a radula are present. Very few forms show cephalic eyes; otocysts are universally present. The gonads are both male and female in the same individual. The genital aperture is single; copulatory organs, often of considerable size, are present.

A mantle-skirt and shell is present in one division of the *Pteropoda* (*Thecosomata*), and in these an extensive subpallial chamber is developed, the walls of which, in the absence of ctenidia, have a branchial function.

In a second division (*Gymnosomata*) the mantle-skirt is aborted, and there is no shell in the adult animal.

The Pteropods inhabit the high seas, floating constantly in the water by means of the lateral fins. They are extremely vivacious in their movements, and are frequently together in prodigious numbers.

Fossil they first appear in the Palæozoic.

Order 1. **THECOSOMATA**, Blainville.

Pteropoda provided with a mantle-skirt, and with a delicate hyaline shell developed on the surface of the visceral hump and mantle-skirt; visceral hump, and consequently the shell, spirally twisted in one family, the *Limacinidæ;* shell often with contracted mouth and dilated body, its walls sometimes drawn out into spine-like processes, which are covered by reflexions of the free margin of the mantle.

Fam. **CYMBULIIDÆ**, Cantraine.

Hyalæidæ, in part, of authors. *Alata*, Wagner, 1885.

Shell straight, bilaterally symmetrical, so-called cartilaginous, quite enveloped in the mantle. The animal cannot completely retire within

it. The animal has a ventral pallial cavity, and the fins form a broad disc, on the dorsal margin of which the cephalic portion is laid back.

The shell of the adult is considerably elongated in a dorso-ventral direction. It is somewhat hollowed out in the form of a boot or slipper, and is more or less broadly open ventrally. It is not homologous with the calcareous shell of other Thecosomata, but is the result of thickening of the integument.

The animal has its visceral portion relatively little developed, and the fin greatly predominates. The cephalic portion is distinct, the lip completely surrounding the mouth. The 2 tentacles are symmetrical, and the right one is not enclosed in a sheath. The verge is situated on the dorsal surface of the head, in the median line in the adult.

Genus 1. Cymbulia, Péron and Lesueur, 1810.

Cymbulia, P. & L., Ann. Mus. Hist. Nat. Paris, xv, 66. Type: *C. Peroni*, de Blainville.

The animal has a natatory disc of considerable breadth, and a ventral lobe on the foot. The cephalic portion is reflected on the dorsal margin of the fin, but is fixed throughout its length, and constricted towards its distal extremity. Jaws are present. Radula having the formula 1 + 1 + 1, the central tooth very broad, laterals with a moderately broad base, unicuspid.

Shell, or "deutoconch," described as cartilaginous or gelatinous, is elongated in a dorso-ventral direction, and has a moderately elongated cavity and a pointed dorsal extremity. The external surface is covered with tubercles arranged in rows parallel to the main axis; the dorsal extremity is always dilated, and projects more or less markedly.

1. Cymbulia parvidentata, Pelseneer, 1888. Plate 6, fig. 1.

Cymbulia parvidentata, Pelseneer, Chall. Rep., xxiii, 1888, 99, pl. 2, f. 12, 13.

Shell slender, proportionally narrower and more elongated than *C. Peroni*, and exhibiting a constriction towards the middle of its length, the dorsal portion long and pointed; the spines on the surface of small size and very uniform even on the borders of the aperture, where they are very large and distinct in *C. Peroni*. The 2 rows of spines which end in the ventral points exhibit at their middle a reentrant angle corresponding to the constriction of the shell. The cavity of the latter is very narrow and of little depth.

Length, 35 mm.

Animal unknown.

Type in the British Museum.

Hab.—Cook Strait ("Challenger").

Fam. **CAVOLINIIDÆ**, d'Orbigny.

Hyalidæ, d'Orbigny. *Cleodoridæ*, Gray. *Cliidæ*, Jeffreys. *Orthoconques*, Fol.

Shell external, calcareous, inoperculated, bilaterally symmetrical, not rolled up in a spiral, but at its apex often dorsally recurved. Animal with its pallial cavity ventral, and its columellar muscle dorsal; the anus situated on the left.

The shell has a variable form, which may always be referred to a hollow cone, more or less modified, flattened dorso-ventrally or circular in section. The apex is quite straight, recurved, or truncated; the mouth broad or narrow; with longitudinal or transverse ribs, &c. The initial portion of the shell is generally distinct from the rest, and represents the embryonic shell.

The animal may be entirely retracted within the shell. The form of the fins and of the posterior lobe of the foot varies considerably. The mouth, the lips, and the tentacles resemble those of the *Limacinidæ* (except *Peraclis*).

KEY TO GENERA.

a. Shell larger at the aperture than just behind, constricted behind the aperture .. .. CUVIERINA.
b. Shell narrower at the aperture than just behind .. .. CAVOLINA.

Genus 1. CAVOLINA, Abildgaard, 1791.

Cavolina, Abildgaard, Skriv. Naturhist. Selsk., i. 1791, 173. Type: *Anomia tridentata*, Forskal. *Rheda*, Humphreys, 1797. *Hyalæa*, Lamarck, 1801. *Archonta*, Montfort, 1810. *Tricla*, Oken, 1815. *Pleuropus*, Eschscholtz, 1825. *Diacria*, Gray, 1842. *Orbignyia*, A. Adams, 1859.

The special characters of the animal chiefly consist in the breadth of the posterior lobe of the foot, and in the presence of lateral prolongations of the mantle, which project from the lateral portions of the aperture (side clefts of the adult) and may cover a considerable portion of the shell.

Shell generally of a horny-brown colour, especially characterized by its much-contracted aperture, which is, however, very broad transversely. The lateral portions of this aperture, which are narrower than the middle part, are almost separated from it by a more or less developed tooth rising from the ventral lip and fitting into a dorsal depression. The dorsal lip, which is longer than the ventral, is always more or less ventrally recurved; the ventral lip, much recurved dorsally, is constricted a little in front of the aperture, and then reflected ventrally. The ventral surface is always bulging. The special form of *Cavolina* depends on the fact that the sides of the shell diverge abruptly outwards, so that the lips appear much prolonged anteriorly. The sides of the shell are often prolonged into a more or less projecting point. The embryonic shell is not separated by a distinct constriction, except in *C. trispinosa* and *C. quadridentata*.

KEY TO SPECIES.

A. Dorsal lip thickened into a pad.
  a. Shell with lateral points .. .. *trispinosa.*

B. Dorsal lip with a thin margin.
  a. Posterior portion of the ventral lip markedly projecting laterally .. .. *longirostris.*
  aa. Ventral lip not more developed than the dorsal.
    b. Shell without appreciable lateral points .. .. *telemus.*
    bb. Shell with distinct lateral points.
      c. Upper lip flattened posteriorly .. .. *uncinata.*
      cc. Upper lip directed straight forwards .. .. *inflexa.*

1. Cavolina inflexa, Lesueur, 1813. Plate 6, fig. 2.

Hyalæa inflexa, Lesueur, Nouv. Bull. Soc. Philom., iii, 1813, 285, pl. 5, f. 3. *H. elongata*, Lesueur, MS., in Blainville, Dict. Sci. Nat., xxii, 1821, 82. *H. vaginellina*, Cantraine, Bull. Acad. d. Sci. Bruxelles, ii, 1835, 380. *H. labiata*, d'Orbigny, Voy. Amérique mérid., v, 1836, 104, pl. 6, f. 21–25. *H. uncinata*, Hoeninghaus, MS., in Philippi, Enum. Moll. Siciliæ, 1836, 101, pl. 6, f. 18, not of Rang. *Diacria inflexa*, Lesueur: Gray, Cat. Moll. Brit. Mus., pt. ii, Pteropoda, 9. *Hyalæa imitans*, Pfeffer, Abhandl. Naturw. Ver. Hamburg, vii, 1880, 90, pl. 7, f. 9*a*. *Cavolinia inflexa*, Les.: Pelseneer, Chall. Rep., xxiii, 1888, 85; Hedley, T.N.Z.I., xxxviii, 1905 (1906), 76.

Shell elongated, conical, compressed on each side, elongated posteriorly, terminated by a recurved point, laterally armed with a short point; aperture ovately transverse, laterally deeply cleft. (Gray.)

Hab.—Off Great Barrier Island, in 110 fathoms.

2. Cavolina longirostris, Lesueur, 1821. Plate 6, fig. 9.

Hyalæa longirostris, Lesueur, MS., in Blainville, Dict. Sci. Nat., xxii, 1821, 81; Pelseneer, Chall. Rep., xxiii, 1888, 79.

Shell ovate-globular, terminated anteriorly with a rather long, arched, channelled beak, posteriorly shortly truncate, laterally provided with short hooked wings, inferiorly 3-ribbed; aperture transverse, narrow. (Gray.)

Var. strangulata, Hedley, 1907. Plate 6, fig. 8.

Cavolina longirostris, var. *strangulata*, Hedley, Rec. A.M., vi, pt. iv, 1907, 299, pl. 54, f. 13. *Cavolinia*, sp., Hedley, T.N.Z.I., xxxviii, 76.

This differs from the typical form by the sudden lateral contraction of the rostrum, which distally expands in a spout. In the typical form the rostrum is produced more gradually from the anterior dorsal margin than in the variety. In var. *strangulata* the posterior lateral angles are less developed.

Hab.—Off Great Barrier Island, in 110 fathoms.

3. **Cavolina telemus,** Linné, 1758. Plate 6, fig. 3.

Monoculus (?) *telemus*, L., Syst. Nat., ed. x, 1758, 635. *Anomia tridentata*, Forskal, Descript. anim., &c., 1773, 124. *Cavolina natans*, Abildgard, Skriv. Naturhist. Selsk., i, 1791, Heft 2, pl. 10. *Hyalæa cornea*, Lamarck, Syst. A.s.V., 1801, 140. *H. papilionacea*, Bory de St. Vincent, Voy. quatre princip. îles mers d'Afrique, i, 1804, 137, pl. 5, f. 1. *Hyale tenuibranche*, Péron and Lesueur, Ann. Mus. Hist. Nat. Paris, xv, 1810, pl. 2, f. 13. *Hyalæa Peroni*, Lesueur, Nouv. Bull. Soc. Philom., iii, 1813, 284. *H. Chemnitziana*, Lesueur, *ibid.*, 284. *H. australis*, Péron, Voy. terres australes, i, 1816, pl. 31, f. 5. *H. Forskalii*, Lesueur, MS., in Blainville, Dict. Sci. Nat., xxii, 1821, 79. *H. affinis*, d'Orbigny, Voy. Amér. mérid., v, 1836, 91, pl. 5, f. 6–10. *H. truncata*, Krauss, Südafric. Moll., 1848, 34, pl. 2, f. 12, not of Lesueur. *Diacria tridentata*, Forsk.: Gray, Cat. Moll. Brit. Mus., pt. ii, Pteropoda, 8. *Hyalæa Cumingii*, Sowerby, Conch. Icon., xx, Pteropoda, f. 5. *Cavolinia tridentata*, Forsk.: Pelseneer, Chall. Rep., xxiii, 1888, 83; Hedley, T.N.Z.I., xxxviii, 1905 (1906), 75. *C. telemus*, A. Adams, A.M.N.H. (3), iii, 1859, 44.

Shell globular, yellowish, pellucid, thin, very finely striated transversely; hinder central process short, terminal tooth longer than the lateral ones. (Gray.)

Hab.—Chatham Islands; Whangarei Heads (C. Cooper); off Great Barrier Island, in 110 fathoms.

4. **Cavolina trispinosa,** Lesueur, 1821. Plate 6, fig. 4.

Hyalæa trispinosa, Les., in Blainv., Dict. Sci. Nat., xxii, 1821, 82; Forbes and Hanley, Hist. Brit. Moll., ii, 380, pl. U, f. 3. *Diacria trispinosa*, Les.: Gray, Cat. Moll. Brit. Mus., pt. ii, Pteropoda, 10. *Pleuropus trispinosus*, Les.: Ad., G.R.M., ii, 611. *Hyalæa trispinosa*, Les.: Boas, "Spolia atlantica," 94, pl. 1, f. 3; pl. 2, f. 14. *Cavolinia trispinosa*, Les.: Pelseneer, Chall. Rep., xxiii, 76; Hedley, T.N.Z.I., xxxviii, 76. *Hyalæa mucronata*, Quoy and Gaimard, Ann. de Sci. Nat. (1), x, 231, pl. 8*b*, f. 1, 2. *Diacria mucronata*, Q. & G.: Gray, *t.c.*, 11. *Hyalæa depressa* Bivona, Efem. sci. Sicilia, 1832, 57, pl. 1, f. 4, 5. *H. cuspidata*, Delle Chiaje, Descr. anim. senza vert. Napoli, 1841, pl. 180, f. 1, 2, not of d'Orbigny. *H. Reeviana*, Dunker, Index Moll., 1853, 2, pl. i, f. 17–20.

Shell depressed, straight, and kite-shaped; anterior extremity, or the portion above the short but very acute lateral spines, is much shorter than the posterior end; the latter produced into a very long and slender straight caudal spine, mostly broken off. Mouth short, narrow, semielliptic; the marginal fissure extending to the lateral spines is linear; both lips briefly and abruptly reflected. Colour transparent white, brownish near the lips and at the commencement of the tail. Upper and lower surfaces of nearly equal convexity, mostly devoid of marked concentric striæ. The former projects semicircularly beyond the straightish labial edge of the latter. Upper surface with a broad rounded central longitudinal fold, generally divided in front into three smaller ones, flanked on each side with a strong narrower fold, leaving a flattish triangular space between it and the end of the lateral spine. Lower surface with a slight fold adjacent to each lateral spine.

Length, 11 mm.

Hab.—Off Great Barrier Island, in 110 fathoms. Atlantic Ocean, Mediterranean, Indian Ocean, and Pacific Ocean.

5. **Cavolina uncinata**, Rang, 1836. Plate 6, fig. 5.

Hyalæa uncinata, Rang, in d'Orbigny, Voy. Amérique mérid., v, 1836 93, pl. 5, f. 11–15. *Cavolina uncinata*, Gray, Cat. Moll. Brit. Mus., pt. ii, 1850, 7; Pelseneer, Chall. Rep., xxiii, 84. *Hyalæa uncinata*, Rang and Souleyet, Hist. Nat. Moll., Ptéropodes, 1852, 37, pl. 2, f. 11, 14; Conch. Icon., xx, pl. 1, f. 1. *H. uncinatiformis*, Pfeffer, "Die Pteropoden des Hamburger Museums," vii, 1880, 85. *H. uncinata*, Rang: Boas, "Spolia atlantica," 119, pl. 1, f. 10; pl. 2, f. 20.

Shell much swollen ventrally, the surface delicately and regularly reticulated, with fine concentric ridges in front; dorsal face with 3 low, radiating ribs, turned downward and nearly evenly rounded at the aperture; lateral spines compressed and curved slightly backward, central spine rather short, stout, and curved upward. *Colour* pale amber.

Length, 9 mm.; breadth, 6 mm.

Hab. — New Zealand. Australia; Pacific, Indian, and Atlantic Oceans.

Genus 2. CUVIERINA, Boas, 1886.

Cuvierina. Boas, "Spolia atlantica," 1886, 131. Type: *C. columnella*, Rang.
Cuvieria, Rang, 1825; not of Péron, 1807. *Triptera* of authors, not of Quoy and Gaimard.

Animal with the aperture of the mantle as large as that of the shell. Posterior portion of the foot slightly hollowed out in its middle region.

Shell straight, elongated, with a smooth surface, with the posterior half conical and pointed, generally caducous in the adult. The anterior half is swollen medianly, but constricted behind the aperture. A partition, concave in front, is found towards the middle of the entire length of the shell, and close beside this the truncation is formed. The transverse section is circular, except towards the aperture, where it is a little compressed, and appears somewhat reniform. Behind the aperture the shell is contracted, but bulges out again towards the partition. The embryonic portion is separated from the rest of the shell by a shallow constriction.

1. **Cuvierina columnella**, Rang, 1827. Plate 6, fig. 6.

Cuvieria columnella, Rang, Ann. Sci. Nat. (1), xiii, 323, pl. 45, f. 1–3. *? Cleodora obtusa*, Quoy and Gaimard, 1824. *Cuvieria oryza*, Benson, 1835. *Triptera columnella*, Gray, 1850. *Cuvieria urceolaris*, Moerch, 1850. *Triptera columnella* and *cancellata*, Pfeffer, 1879. *Cuvierina columnella*, Rang: Pelseneer, Chall. Rep. xxiii, 67; Hedley, T.N.Z.I., xxxviii, 76.

This is the only living species, and its characters are those of the genus.

Length, 14 mm.

Type (?).

Hab.—Off Great Barrier Island, in 110 fathoms.

Fam. **LIMACINIDÆ**, Gray.

Spirialidae, Chenu.

Animal with a dorsal pallial cavity, and a ventral columellar muscle; anus situated on the right side. The animal is twisted like the shell, which it completely fills, and into which it may be completely retracted. The margin of the mantle bears, on the right-hand side, and somewhat ventrally, a long extensile appendage. The posterior lobe of the foot, which bears the operculum, and is topographically ventral, is hollowed out on the middle of its free margin. The fins do not exhibit towards their distal extremity an area without muscular fibres.

Shell very delicate, external, twisted into a left-handed spiral, small, translucent, with slight colouring. Operculum spiral, very delicate, glassy, and transparent. It is fixed by a portion of its surface to the posterior face of the ventral lobe of the foot.

Genus 1. Limacina, Cuvier, 1817.

Limacina, Cuvier, "Règne animal," ii, 1817, 380. Type: *Clio helicina*, Phipps. *Heterofusus*, Fleming, 1823. *Spiratella*, de Blainville, 1824. *Heliconoides*, d'Orbigny, 1836 (in part). *Spirialis*, Eydoux and Souleyet, 1840 (in part). *Helicophora*, Gray, 1842. *Scæa*, Philippi, 1844. *Protomedea*, G. O. Costa, 1861 (in part). *Embolus*, Jeffreys, 1869.

Animal with an indistinctly defined head, which is only marked externally by the lips on the border of the mouth and by the tentacles. Fins elongated, enlarged, truncated at their free end.

Shell umbilicate, with turns gradually increasing; with a fairly large aperture, and with a columella not prolonged into a rostrum; surface smooth or striated. The height of the spire, the form of the surface and that of the aperture, and the size of the umbilicus vary according to the species. Operculum semilunar, with a right-handed spiral of a few whorls.

1. **Limacina australis**, Eydoux and Souleyet, 1840. Plate 6, fig. 7.

Spirialis australis, E. & S., Revue Zool., iii, 1840, 237. *Limacina australis*, E. & S.: Pelseneer, Chall. Rep., xxiii, 25, pl. 1, f. 6; Iredale, T.N.Z.I., xl, 384.

Shell smooth, milky-white, the spire somewhat elevated with a blunted or obtuse apex, with 6 or 7 bulging whorls, separated by a very deep suture, with the last whorl much expanded and convex, and projecting more in proportion than all the foregoing. Aperture quadrangular, somewhat angled in front; columella straight, reflected to the right; umbilicus broad. Operculum approximately oval, with an almost straight columellar margin, and with a spiral portion measuring barely two-fifths of the entire length.

Diameter, maj., 1·5 mm.; height, 2–2·5 mm.

Animal with a small lobe on the dorsal margin of each fin.

Type (?).

Hab.—Lyall Bay, in shell-sand (Miss Mestayer).

Remarks.—The type is from Cape Horn (Souleyet). The species has a wide distribution round the South Pole. Living specimens were obtained by the "Challenger" from Marion Island to Crozets, at Kerguelen Island, Heard Island, and in the vicinity of antarctic ice, in latitude 63° 30′ S.

The specimen from Lyall Bay was identified by Mr. C. Hedley, of Sydney; I have not seen it.

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Class III. **GASTROPODA,** Cuvier.

(= *Paracephalophora*, de Blainville; *Anisopleura*, Lankester.)

The Gastropods are specially characterized, firstly, by their asymmetrical organization; secondly, by their well-developed head; and, thirdly, by their shell, which is formed of one piece, and coiled in a spiral, at least in the larval stage. The asymmetry of some of the principal organs of the body is the chief characteristic of the *Gastropoda*. The essential feature of this asymmetry is that the anus generally lies to one side of the median plane; that the ctenidium (gill-combs), the osphradium (olfactory organs), the hypobranchial gland (or pallial mucous gland), and the auricle of the heart are single, or at least are more developed on one side of the body than the other; and that there is only one genital orifice, which lies on the same side of the body as the anus.

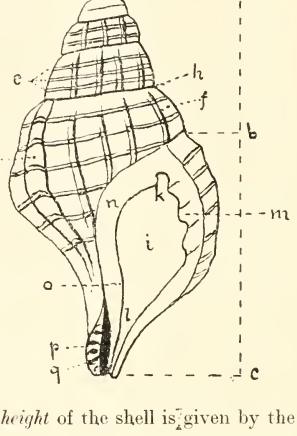
The *Gastropoda* are essentially aquatic animals, and the more archaic species are marine; the stylommatophorous pulmonates—*Cyclophoridæ*, &c.—are terrestrial.

The diet of *Gastropoda* varies according to the group under consideration. Generally speaking, the carnivorous habit is due to specialisation; various forms live and feed on colonial invertebrates, such as *Hydrozoa*, &c. Some *Gastropoda* are parasitic, generally in or upon Echinoderms.

Some 30,000 species of *Gastropoda* have been enumerated, of which 20,000 belong to the present epoch, and are distributed in every region of the globe. Some marine species are found at a depth of over 2,500 fathoms, and some *Pulmonata* live in the Himalayas at a height of nearly 17,000 ft. above the level of the sea. Some freshwater *Gastropoda* exist at a depth of 180 fathoms below the surface of certain lakes; others live in subterranean waters, and some *Pulmonata* are found in caverns into which daylight does not penetrate. Palæontology shows that these animals were already in existence in the Cambrian period, at the commencement of the Palæozoic epoch.

Terms employed to denote various Parts of the Univalve Shell.

The univalve shell is composed of one or a number of whorls, the whole series of whorls, except the last or *body-whorl* (*b–c*), forming the *spire* (*a–b*). A *whorl* is a single revolution of the spiral cone round the axis. The *apex* consists of the embryonic shell or *protoconch* (*d*). The line of junction between two successive whorls is the *suture* (*h*). The *sculpture* may consist of *spiral* lines or ribs (*e*), and of *axial* ribs (*f*) and varices (*g*), the latter being marginal ribs of the aperture of an earlier stage of growth. The mouth or *aperture* (*i*) may have a *posterior canal* or *channel* (*k*) and an *anterior canal* (*l*); on the right side is the *outer lip* (*m*), and on the left the *inner lip* (*n*) spread over the pillar, or *columella* (*o*). At the base a a *siphonal fasciole* (*p*) and an *umbilicus* (*q*) may be present. The *height* of the shell is given by the line *a–c*.



Subclass I. **STREPTONEURA**, Spengel.

(= *Prosobranchia*, Milne-Edwards; *Cochlides*, von Ihering.)

These are dioecious *Gastropoda*, with the exception of a few aberrant genera, and are characterized by the maximum torsion exhibited by the visceral mass and visceral commissure, the latter being always twisted into a figure of eight. The right moiety of this commissure is situated above the digestive tube, and is known as supra-intestinal; the left moiety is situated below the digestive tube, and is known as infra-intestinal.

The head of *Streptoneura* bears only a single pair of tentacles. The radular teeth, when there is more than one on either side of the median tooth, are of several different kinds in each transverse row. The heart is almost always posterior to the branchia.

The subclass includes two orders, *Aspidobranchia* and *Pectinibranchia*.

Order 1. ASPIDOBRANCHIA.

(= *Diotocardes; Scutibranchia.*)

These are *Streptoneura* in which the nervous system is still but little concentrated. The pedal centres have the form of long ganglionated cords, to the anterior end of which the pleural centres are attached; the cerebral ganglia are widely separated from one another, and are united by a long commissure lying in front of the buccal mass and the salivary glands. The eye is open, or, if closed, has a very small pellucida. The central teeth of the radula are multiplied. Ctenidia are almost always present; they are bipectinate, and free at their distal ends. As a rule, the Aspidobranchs exhibit well-marked traces of the original bilateral symmetry, having two auricles to the heart, and two kidneys (one only in the *Neritacea*).

The order *Aspidobranchia* includes the most archaic Gastropods; it includes two suborders, the *Docoglossa* and *Rhipidoglossa*.

Suborder 1. DOCOGLOSSA.

(= *Onychoglossa*, O. Sars.)

The organs of respiration are represented either by a ring of laminæ (secondary or pallial gills) beneath the mantle-margin, or by a comb-shaped true gill in front, anterior to the heart, or by both true and secondary gills. The eyes are open, and devoid of a crystalline lens. There are two osphradia, but neither hypobranchial glands nor operculum. The radula is usually very long, bearing vertically elongated beam-shaped and hooked teeth, and there are at most 3 marginal teeth on either side. The heart has only 1 auricle, and neither it nor the pericardium are traversed by the rectum. The visceral mass is cone-shaped, without a spire. Shell symmetrical, non-spiral, conic or bowl-shaped. Cambrian to Recent. The suborder includes about 1,400 species.

Vernacular name.—Limpets.

Maori.—Ngakihi.

Fam. ACMÆIDÆ, Philippi.

Animal with a single bipectinate ctenidium on the left side, free for the greater part of its extent. Radula with 1 central tooth on each side, 2 lateral teeth (sometimes absent), and sometimes with 1 or 2 marginal teeth.

Shell patelliform, conical, the apex more or less anterior, the embryonic shell conical, not spiral. Cretaceous to Recent.

They live on rocks and seaweeds, generally at very moderate depths.

The shells, which are extremely variable, may be distinguished from *Patellidæ* by their different texture and the more or less distinct internal border of the aperture; they are never iridescent within.

Genus 1. Acmæa, Eschscholtz, 1830.

Acmæa, Esch., "Appendix to Kotzebue's Neue Reise," vol. ii, p. 24, 1830. Type: *Acmæa mitra*, Esch. *Tectura*, Aud. & Milne-Edw., Ann. Sci. Nat., xxi, 1830 (1831), 326. *Tectura* of Gray, H. and A. Adams, &c. *Patelloidea*, Q. & G., Voy. Astrol., iii, 349. *Lottia* (in part), Philos. Trans., 1833, 800. *Erginus*, Jeffreys, A.M.N.H. (4), xix, 1877, 231. *Collisella*, Dall, Amer. Journ. Conch., vi, 1871, 245. *Collisellina*, Dall, *l.c.*, 154.

Tentacles rather long, cylindrical; eyes situated on their posterior upper side. Foot semicircular; ctenidium large, directed from left to right; anal orifice on the right side, and near the extremity of the adductor muscle.

Shell patelliform, usually solid, oval or circular, summit anteriorly directed and more or less in front of the middle; interior not iridescent, and generally having an internal marginal border of colour.

Pilsbry arranges the species into six geographical divisions—(1) North Atlantic and Arctic; (2) western coast of North America; (3) western coast of South America; (4) West Indies; (5) Japan; (6) Indo-Pacific.

Tertiary to Recent. One species is known from the Cretaceous of America.

Key to Species.

A. Shell distinctly ribbed, ribs visible to the naked eye.
- *a.* Colour white, light brown, seldom greenish.
  - *b.* Ribs 8, shell star-shaped .. .. .. *octoradiata.*
  - *bb.* Ribs more than eight.
    - *c.* Ribs elevated, roughened.
      - *d.* With 7 primary stouter ribs, margin laciniate .. .. *stella.*
      - *dd.* With 14–22 subequal ribs, margin denticulate .. .. *corticata.*
    - *cc.* Riblets distinct, but lower, not roughened.
      - *d.* Riblets 10–30, conspicuous, apex at the anterior third, inside usually rayed with pinkish .. .. .. *rubiginosa.*
      - *dd.* Riblets 30–50, low, apex at the anterior fourth, spatula white, sometimes with a brown spot, inside with a pinkish pinkish border .. .. .. *cingulata.*
      - *ddd.* Riblets 25–50, sharp, usually no interstitial riblets, spatula dark brown .. *intermedia.*
- *aa.* Colour pink, numerous close riblets .. .. *Campbelli.*
- *aaa.* Colour brown, usually tessellated with white or green, riblets delicate or distinct and granulose .. .. *septiformis.*

AA. Shell smooth to the naked eye, sculpture more or less microscopic.
a. Shell small, whitish, with 10 radiate pinkish rays .. *roseoradiata.*
aa. Shell small, laterally compressed, navicular, brown .. *scapha.*
aaa. Shell usually larger, variegated.
b. Shell flattened, membranaceous, with concentric brown and white or greenish bands .. .. *fragilis.*
c. Shell thin, pellucid.
d. Surface painted with a brown network .. *dædala.*
dd. Whitish, with brown radiate lines .. *subtilis.*
cc. Shell more solid, not pellucid.
d. Shell rather large, length to 30 mm., apex anterior, but sometimes removed to anterior fourth .. .. .. *pileopsis.*
dd. Shell smaller, not exceeding 20 mm. in length.
e. Apex mostly anterior, sharp and hooked, black, tessellated and blotched with white .. .. *cantharus.*
ee. Shell high and rounded or conoidal.
f. Central area variegated with brown, sometimes nearly white .. *parviconoidea.*
ff. Central area purplish-black, more or less distinctly stellate; young shell white, with a central black star .. .. *nigrostella.*
eee. Conoidal, with numerous radiate black rays. Interior bluish-white, spatula white, with a few brown spots, border yellow, with brown rays .. *Helmsi.*

Subgen. 1. Acmæa, s. str.

Muzzle with lappets, no marginal teeth. Formula of teeth of radula: $2\ (1+0\times1)\ 2$.

1. *Group of* Acmæa cingulata.

Teeth of radula typical, with short, rounded cutting-points.

1. Acmæa cingulata, Hutton, 1883. Plate 5, fig. 6.

Acmæa cingulata, Hutton, N.Z.J.S., i, 477; T.N.Z.I., xvi, 215; Man. Conch. (1), xiii, 53; P. Mal. S., vii, 316, pl. 27, f. 3–5.

Shell oval, conoidal, moderately solid, white to yellowish-brown, with numerous radiating *ribs*, which are low, rounded, and varying in number from 30 to 50; there are usually 10 to 15 primary ribs, and numerous finer riblets in the interstices; a number of concentric ridges sometimes render the ribs slightly crenate. *Colour* mostly white, sometimes light brown, the ribs nearly white. *Apex* at the anterior fourth, oval in shape and convex, mostly dark brown; anterior slope nearly straight. *Inside* white, porcellanous, central

area white, rarely with a small brown spot underneath the apex; margin indistinctly crenulate, with a narrow pinkish border.

Length, 17 mm.; breadth, 13 mm.; height, 6 mm.

Dentition. — Hutton, T.N.Z.I., xvi, 215, pl. 11, fig. 5. A copy of the drawing is here reproduced. It is typical, resembling very much that of *A. mitra*, Esch., with short, stout, conical cutting-points.

Teeth of Radula.

Type in the Canterbury Museum, Christchurch.

Hab.—Dunedin and Lyttelton (Hutton); Lyall Bay (H. S.); East Cape Lighthouse. On rocks between tide-marks, not common: frequently found on shells of *Haliotis*.

Remarks.—Distinguished from is nearest ally, *A. rubiginosa*, by the more anterior apex, the more numerous and lower ribs, the white interior, and the purplish or pinkish border. Always covered with a thick layer of Nulliporites.

2. Acmæa intermedia, Suter, 1907. Plate 5, fig. 7.

Acmæa intermedia, Suter, P. Mal. S., vii, 1907, 316, pl. 27, f. 6–8.

Shell oval to subcircular, conoidal, thin, light brown, finely ribbed. The fine, equidistant, equal, rounded *riblets* number from 25 to 50, interstitial riblets are mostly absent; a few concentric distinct growth-lines are commonly present. *Colour* light brown, the riblets white. *Apex* at about the anterior third, near the centre in subcircular examples; nucleus very small, oval, dark brown. *Inside* shining, with the central area dark brown, the border much lighter in colour.

Length, 7·5 mm.; breadth, 6 mm.; height, 2·25 mm. (type). Other specimens measure 11 mm. by 9 mm. by 4·5 mm., and 8 mm. by 6·5 mm. by 3 mm.

The *dentition* is unknown.

Type in my collection.

Hab.—Near the Bounty Islands, in 50 fathoms (Captain Bollons).

Remarks.—This species has more equal, equidistant, and finer riblets than *A. rubiginosa* and *cingulata;* there is an almost constant absence of shorter interstitial riblets; no rays on the inside and no marginal border are present, and the sharply defined uniformly dark-brown central area is characteristic. It is probable that the shells were washed down from shallower water, as all the specimens I saw were empty, and more or less worn.

3. Acmæa roseoradiata, Suter, 1907. Plate 5, fig. 8.

Acmæa roseoradiata, Suter, P. Mal. S., vii, 1907, 317, pl. 27, f. 9, 10.

Shell very small, oval, conical, with broad pinkish radiate rays. The *sculpture*, which only a good lens will reveal, consists of 20 very indistinct low riblets on the lower half of the shell, each bordering one of the pinkish rays; upper half with about twice the number of microscopic subobsolete radiate striæ. The *colour* of the upper half is light pinkish-brown, of the lower part white, with 10 broad radiate pinkish rays, unequally distanced. *Apex* sharply pointed, very little in front of the centre. *Inside* with the central area pinkish, slightly lighter coloured in the middle; border rayed like the outside, margin sharp.

Length, 3·5 mm.; breadth, 2·5 mm.; height, 1·5 mm.

The *dentition* is unknown.

Type in my collection.

Hab.—The type is from 18 fathoms, Port Pegasus, Stewart Island (Captain Bollons); Dusky Sound, 30 fathoms (R. Henry); Taumaki Island, west coast of the South Island, in 10 fathoms (Captain Bollons); Snares, in 50 fathoms (Captain Bollons).

Remark.—This pretty little shell is well characterized, and quite distinct from all the other known New Zealand species of the genus.

4. Acmæa rubiginosa, Hutton, 1873. Plate 5, fig. 9.

Fissurella rubiginosa, Hutton, C.M.M., 42. *Glyphis rubiginosa*, Hutt., Man. Conch. (1), xii, 216. *Acmæa lacunosa*, Reeve: Suter, T.N.Z.I., xxxiv, 218, not of Reeve. *A. rubiginosa*, Hutton: Suter, P. Mal. S., vii, 1907, 315, pl. 27, f. 1, 2; Iredale, T.N.Z.I., xl, 376.

Shell oval, conoidal, white or light rufous, ribbed. The radiating ribs are very distinct, rounded, their number variable; there are from 10 to 20 *ribs* extending from the apex to the margin, besides a number of shorter interstitial ribs, but the total number does not generally exceed 30. The encircling growth-lines are fine, and close together. *Colour* rufous, with the ribs white; dead shells are pure-white, the apex brown. The apex is usually situate at the anterior third, sometimes a little nearer the centre; it is small, and has the aspect of a callosity filling up a fissurelloid perforation. *Inside* porcellanous, white, with radiating pinkish rays, corresponding to the interspaces between the ribs. Central area more or less clouded with brown, margin slightly crenate.

Length, 18 mm.; breadth, 13 mm.; height, 6 mm.

The *dentition* is unknown, but is most likely the same as in *A. cingulata*.

Type in the Dominion Museum, Wellington.

Hab.—Chatham Islands (type); near Taumaki Island, west coast of the South Island, in 10 fathoms (Captain Bollons); Bay of Islands; Lyttelton; Shag Point (Iredale).

Remarks.—The number of ribs and the height of the shell are very variable. Most specimens have a thick layer of Nulliporites. Our *A. rubiginosa*, *cingulata*, and *corticata* have been compared with the type of *A. lacunosa*, Reeve (habitat unknown), in the British Museum, and all of our three species are distinct. The late von Martens suggested that *A. rubiginosa*, Hutt., and *A. lacunosa*, Reeve, might be identical.

Fossil in the Pliocene.

2. *Group of* Acmæa fragilis.

Teeth having the same formula, but the cutting-points hamate.

5. Acmæa Campbelli, Filhol, 1880. Plate 5, fig. 10.

Patella Campbelli, Filhol, "Comptes Rendus," xci, 1880, 1095; Filhol, Miss. I.C., 1885, 530; *Acmæa Campbelli*, Filhol: Suter, P. Mal. S., vii, 321, pl. 27, f. 19, 20.

Shell small, roundish-oval, conical, subpellucid, finely ribbed, pink. The radiate *riblets* are very numerous and close together, about 40 reach from apex to margin and about 20 are interstitial; they are broadly convex, and crossed by numerous very fine concentric growth-lines. The *colour* is uniformly pink. *Apex* small, rounded, situated at about the anterior third of the length; anterior slope straight, posterior slope very little convex. *Inside* pinkish-white, with white radiating rays, corresponding to the riblets; central area pink; margin crenulate, with a narrow pink border.

Length, 5 mm.; breadth, 5 mm.; height, 3 mm. (type). Length, 5·75 mm.; breadth, 4·75 mm.; height, 3 mm. (from Auckland Islands).

Dentition.—Suter, P. Mal. S., vii, pl. 27, f. 21.

Type in the Mus. Hist. Nat., Paris.

Hab.—The type was collected by the late Professor Filhol at the entrance to the north-east bay of Campbell Island; Auckland Islands (Captain Bollons).

Remark.—This shell, insufficiently described and not figured by Filhol, seems to be rare, or easily overlooked.

6. Acmæa cantharus, Reeve, 1855. Plate 7, fig. 1.

Patella cantharus, Reeve, Conch. Icon., 1855, fig. 131. *Acmæa cantharus*, Reeve, Man. Conch. (1), xiii, 55, pl. 37, f. 1, 2; Verco, T.R.S. S.Aust., xxx, 215, not of Reeve; Suter, P. Mal. S., vii, 320; Iredale, T.N.Z.I., xl, 376.

Shell small, ovate, thin, apex anterior, blotched with white. The *sculpture* consists of fine microscopic radiate striae; one of my specimens shows a few well-marked distant riblets on the posterior side, but this is an exception; concentric growth-lines are fairly conspicuous. *Colour* black or brown, blotched or tessellated with white. *Apex* very anterior, sharp, and hooked; anterior slope concave. *Inside* light

blue, occasionally light brown, central area chestnut-brown; the sharp margin having a rather broad brown border, often banded or dotted with yellowish-brown.

Length, 17 mm.; breadth, 13·5 mm.; height, 4·5 mm.

Dentition.—Suter, P. Mal. S., vii, pl. 27, f. 17, 18.

Type in the British Museum.

Hab.—The type was collected in New Zealand by Earl, no exact locality given; Oamaru; St. Clair, Dunedin (H. S.); Greymouth; Preservation Inlet; Auckland Islands; Macquarie Island (A. Hamilton).

Remarks.—At first sight this species seems to be a young *A. pileopsis*, but there are some points which separate the two. First of all, *A. cantharus* never attains a much larger size than that indicated; to the naked eye it is smooth, the radial sculpture being visible only under a good lens. If exceptionally a few ribs are present, they are much farther apart than those of *A. pileopsis*. The apex is much sharper and more hooked, also much more constant in its anterior position. The inside between marginal band and central area is really light blue, not whitish or bluish-white as in *A. pileopsis*. It lives, like most other species, on rocks between tide-marks; and I have never seen it high up, where only the spray of the sea could reach it.

7. Acmæa dædala, Suter, 1907. Plate 5, fig. 11.

Acmæa dædala, Suter, P. Mal. S., vii, 323, pl. 27, f. 30–32. *A. flammea*, Quoy and Gaimard: Hutton, T.N.Z.I., xv, 1882 (1883), 132; P.L.S. N.S.W., ix, 373, not of Quoy and Gaimard. *A. dædala*, Sut., T.N.Z.I., xl, 379.

Shell small, oval, depressed, pellucid, radially netted with brown, apex anterior. The *sculpture* consists of numerous microscopic radiate striae, crenulated by fine incremental lines. *Colour* light yellow; numerous light-brown radiate lines give by anastomosing the whole surface a net-like appearance. *Apex* anterior, at about the anterior eighth, slightly pointed; anterior slope concave. *Interior* bluish-yellow, showing the ornamentation of the outside; central area indistinctly marked; margin sharp.

Length, 7 mm.; breadth, 5·5 mm.; height, 2 mm. (type).

Dentition.—Hutton, T.N.Z.I., xv, 128, pl. 15, fig. N; P. Mal. S., vii, pl. 27, f. 32.

Type in the Canterbury Museum, Christchurch.

Hab.—Auckland Harbour (type); Rakino Island; Cook Strait; Wellington Harbour; Sumner; Lyttelton; Greymouth; according to Hutton, it is found as far south as Dunedin; Shag Point; Cape Saunders (Iredale).

Remarks.—In this instance again the late Captain Hutton cannot have seen specimens of *A. flammea*, Q. & G., or he would never have assigned our small, fragile, and pellucid shell to that species, which is much larger and solid. This is one of our fairly constant species.

Fossil in the Pliocene.

Subsp. **subtilis**, Suter, 1907. Plate 5, fig. 12.

Acmæa dædala, subsp. *subtilis*, Suter, P. Mal. S., vii, 1907, 324, pl. 27, f. 33.

This subspecies has the same microscopic sculpture as the species, but it is more transparent, more fragile, smaller, whitish, ornamented with fine brown radiate lines. Interior whitish, showing all the brown lines; central area slightly greenish, polished, but indistinctly circumscribed.

Length, 2·5 mm.; breadth, 1·5 mm.; height, 0·05 mm. (type). Length, 6·5 mm.; breadth, 4·5 mm.; height, 1·75 mm. (Taumaki specimen).

Dentition unknown.

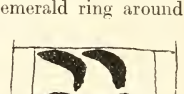
Type in my collection.

Hab.—Between Little Barrier Island and Tiri Tiri Island, in 20 fathoms, type (R. H. Shakespear); Taumaki Island, in 10 fathoms (Captain Bollons); Shag Point; Cape Saunders (Iredale).

8. **Acmæa fragilis**, Chemnitz, 1790. Plate 7, fig. 2.

Patella fragilis, Chemn., Conch. Cab., xi, f. 1921. *Patelloidea fragilis*, Q. & G., Voy. Astrol., Zool., iii, 351, pl. 71, f. 28–30. *Acmæa fragilis*, Q. & G., Man. Conch. (1), xiii, 59, pl. 37, f. 14, 15. *Patella unguis-almæ* Lesson, Voy. Coq., Zool., ii, 420. *Patella Solandri*, Colenso, Tasm. Journ. Nat. Sci., ii, 1844, 226, 250; T.N.Z.I., xiv, 168. *A. fragilis*, Chemn., P. Mal. S., vii, 317.

Shell ovate, flattened, membranaceous, pellucid, with concentric bands of brown and greenish-white. The whole surface is *sculptured* by exceedingly fine, close, subequidistant radiate striæ, cut up into minute oval nodules by growth-lines. *Colour* dark brown, lighter near the apex, banded with narrow white or light-green concentric lines. *Apex* anterior, submarginal, exactly in the middle line, sharply pointed, and directed forward. *Inside* with an emerald ring around the muscle-impression, margin sharp, with a brown border; central area showing the concentric bands of the dorsal part of the shell, and having an elongated patch of light emerald in the centre.



Teeth of Radula.

Length, 15 mm.; breadth, 12 mm.; height, 2 mm.

Dentition.—The 2 central and 2 anterior inner lateral teeth are hamate, the outer posterior laterals small and conical.

Anatomy.—M. A. Willcox, "Jenaer Zeitschrift," xxxii, 1898, pp. 411–56, pl. 17–19.

Dentition.—Suter, P. Mal. S., vii, 318, pl. 27, f. 11.

Type (?).

Hab.—Throughout New Zealand and at the Chatham Islands, under stones between tide-marks. It is local in distribution.

Remark.—This is one of our most constant species.

9. **Acmæa Helmsi**, E. A. Smith, 1894. Plate 7, fig. 3.

Acmæa Helmsi, E. A. Smith, P. Mal. S., i, 1894, 58, pl. 7, f. 4, 5; Suter, P. Mal. S., vii, 1907, 324.

Shell small, depressed cap-shaped, almost smooth, bluish-grey, ornamented with numerous radiating reddish-black narrow lines. *Apex* subterminal, anterior slope slightly concave, posterior slope convex, arcuate. *Interior* greenish; central area white, with a few rufous spots; margin but faintly crenulate; border narrow, yellow, marked all round with reddish-black rays. (Translation of E. A. Smith's diagnosis.)

Length, 11·5 mm.; breadth, 9 mm.; height, 4 mm.

Dentition unknown.

Type in the British Museum.

Hab.—Greymouth, type (R. Helms); Cape Egmont (R. Murdoch).

10. **Acmæa parviconoidea**, Suter, 1907. Plate 5, fig. 13.

Acmæa parviconoidea, Suter, P. Mal. S., vii, 1907, 321, pl. 27, f. 22–25. *A. conoidea*, Quoy and Gaimard: Hutton, T.N.Z.I., xv, 132; P.L.S. N.S.W., ix, 373, not of Quoy and Gaimard.

Shell small, thin, highly conical to depressed conoidal, oval, with very fine radiate striæ and irregular brown bands. Good specimens show indistinct and very low radiate *riblets*, corresponding to the brown lines, and under a strong lens fine and close radiate threads can be distinguished, crossed by still finer concentric growth-lines; in most examples this sculpture is lost, the shells being eroded. The *colour* of the type is light brown, with a few dark concentric bands and spots around the margin; the much more common conoidal form is dirty-white, with radiate brown or black lines which reach up to the apex, or, more often, ornate only the lower half of the shell, the upper half being tessellated with black and white. *Apex* at about the anterior third, directed forward and sharply pointed, but very often rounded off by erosion; the slopes are broadly convex posteriorly, straight or distinctly concave anteriorly. *Interior* light brown to white; central area dark brown, with patches of lighter colour, sometimes quite white; margin sharp, with brown dots and lines.

Length, 4·5 mm.; breadth, 4 mm.; height, 3·5 mm. (type). Length, 9 mm.; breadth, 7 mm.; height, 4 mm. (the common form).

Dentition.—Hutton, T.N.Z.I., xv, 127, pl. 15, f. K; Suter, P. Mal. S., vii, 322, pl. 27, f. 24, 25.

Type in the Canterbury Museum, Christchurch.

Hab.—The type is from Sumner, near Christchurch, where it is found living on rocks between clusters of *Modiolus ater;* Heathcote Estuary; Lyttelton; Oamaru; Cape Saunders; Greymouth; Taumaki Island; Cook Strait; Evans Bay, Wellington Harbour; East Cape Lighthouse; Auckland Harbour; west coast, between Manukau and Kaipara; Bay of Islands; Chatham Islands.

Remarks.—The specimens selected as the type by the late Captain Hutton represent really an extreme form of the species, the high conical and rounded shape being no doubt due to environment; it has a striking likeness to the figures given by Quoy and Gaimard, but when specimens are compared there can be no more doubt that the New Zealand form is quite distinct from the much larger, more solid, and somewhat differently coloured Australian species.

I have specimens from Tasmania which correspond exactly with *A. parviconoidea*. The variability of this species in shape and colouring is considerable.

Var. **leucoma**, Suter, 1907.

Acmæa parviconoidea, var. *leucoma*, Suter, P. Mal. S., vii, 1907, 322.

Shell small, thin, opaque, depressed conoidal. *Sculpture*, if any, lost by erosion. *Colour* white. *Apex* obtuse, at about the anterior fourth or fifth. *Inside* white; central area greenish-white; margin sharp, with a few small brown dots.

Dentition unknown.

Type in my collection.

Hab.—Heathcote Estuary, near Christchurch, type (H. S.); Dunedin Harbour (Iredale).

Var. **nigrostella**, Suter, 1907. Plate 5, fig. 14.

Acmæa parviconoidea, var. *nigrostella*, Suter, P. Mal. S., vii, 1907, 322, pl. 27, f. 26–29.

The young *shell* reveals under a good lens distant low radiate *riblets* and fine concentric growth-lines. The *colour* is white, the centre being occupied by a purplish-black 4- to 9-rayed star; there are sometimes 2 short posterior marginal rays; round the apex a few concentric rows of small, oval, vivid blue spots. *Inside* white; central area purplish-black, sending off 4 to 9 rays towards the margin. The adult shell has lost all its sculpture; the *colour* markings on a whitish ground consist of 2 lateral and 2 posterior black rays, descending from the apex and extending over only a short distance; the margin is adorned with numerous short black lines. *Inside* yellowish-white, the central area occupied by the now distorted star of purplish-black; margin sharp, with a broad border rayed with black.

Length, 10 mm.; breadth, 7 mm.; height, 5 mm. (adult specimen). Length, 4 mm.; breadth, 3 mm.; height, 1·5 mm. (young specimen).

Dentition unknown.

Type in my collection.

Hab.—Titahi Bay, Cook Strait, type (Miss Mestayer); Banks Peninsula (Iredale); near Taumaki Island, in 10 fathoms (Captain Bollons); Bay of Islands (J. C. Anderson).

Remarks.—Only one adult specimen from the first-named locality. The very pretty small forms no doubt live in the laminarian zone, and very likely never attain a much larger size there; but specimens reaching the littoral zone will no doubt grow to the full size of the species, with its most constant characters.

11. Acmæa pileopsis, Quoy and Gaimard, 1834. Plate 7, fig. 4.

Patelloidea pileopsis, Q. & G., Voy. Astrol., Zool., iii, 359, pl. 71, f. 25–27. *Acmæa pileopsis*, Q. & G., Man. Conch. (1), xiii, 57, pl. 37, f. 90–92. *Patelloides antarctica*, Hombron et Jacquinot, Ann. Sci. Nat. (2 ser.), xvi, 1841, 190; Man. Conch. (1), xiii, 157. *Patella floccata*, Reeve, Conch. Icon., 1855, fig. 106; Man. Conch. (1), xiii, pl. 69, f. 38, 39; E. A. Smith, P. Mal. S., i, 59; Suter, *l.c.*, vi, 354. *Acmæa pileopsis*, Q. & G., P. Mal. S., vii, 319.

Shell comparatively large, ovate-convex, radiately striated, blackish and dotted with whitish. The *sculpture* consists of very numerous fine thread-like radiate striæ, crenulated by concentric growth-lines. Adult shells may show only the incremental lines, the radiate ornamentation having been worn off. *Colour* greenish-brown, dotted and netted with white or light green; specimens from the subantarctic islands are often uniformly brown. *Apex* anterior, extending as far as the margin, but occasionally situated as far back as the anterior fourth of the length, slightly hooked; anterior slope concave, seldom straight. *Inside* white or bluish-white; central area chestnut-brown; a dark-brown band inside the margin, very often banded with yellowish-brown; margin sharp.

Length, 20·25 mm.; breadth, 15·75 mm.; height, 9 mm. (type). Length, 28 mm.; breadth, 24 mm.; height, 10 mm. (from Manukau coast). Length, 30 mm.; breadth, 23 mm.; height, 11 mm. (from Auckland Islands).

Dentition.—Hutton, T.N.Z.I., xv, 127, pl. 15, f. M; P. Mal. S., vii, pl. 27, f. 15, 16.

Type in the Mus. Hist. Nat., Paris.

Hab.—Both main islands of New Zealand; Bay of Islands (Q. & G.); west coast of Manukau (C. Spencer); Kawhia (R. Murdoch); French Pass, type (Q. & G.); Lyttelton (H. S.); Snares (Captain Bollons); Auckland Islands (A. Hamilton); Campbell Island (Captain Bollons).

Remarks.—All the specimens I have found were fixed to rocks in excavations considerably above high-water mark, and protected against rain. There is considerable variation in the form of the shell, some being elongated oval, others more rounded; again, they may be high or much depressed. The situation of the apex varies, and the whitish dots are often small and numerous, or larger, elongate or triangular, and fewer in number; they may be present only near the margin, or altogether absent.

12. Acmæa scapha, Suter, 1907. Plate 5, figs. 15, 15*a*.

Acmæa scapha, Suter, P. Mal. S., vii, 324, pl. 27, f. 34, 35.

Shell very small, long and narrow, laterally compressed, sides parallel. Nearly the whole surface of my specimens is eroded, but near the margin traces of radiate fine *riblets* can be seen. *Colour* light brown, with a few concentric bands of darker. *Apex* situate at about the anterior fourth, rounded; side slopes steep and straight, anterior slope straight, posterior slope convex. *Inside* with the central area dark brown, lighter under the apex, a narrow brown border on the margin; space between this and the spatula covered by a whitish callus.

Length, 4 mm.; breadth, 1·75 mm.; height, 1·5 mm.

Dentition unknown.

Type in my collection.

Hab.—Dunedin, type (A. Hamilton); Blind Bay, Nelson.

Remarks.—This curiously shaped species resembles somewhat the Californian species *A. palacea*, Gould, and *A. depicta*, Hinds. Whether in this case the narrow elongated form is an adaptation to life on fronds of seaweeds I am unable to say, but it seems very likely.

13. Acmæa septiformis, Quoy and Gaimard, 1834. Plate 7, fig. 5.

Patelloidea septiformis, Q. & G., Voy. Astrol., Zool., iii, 1834, 362, pl. 71, f. 43, 44. *Acmæa septiformis*, Q. & G., Man. Conch. (1), xiii, 55, pl. 37, f. 93, 94. *A. scabrilirata*, Angas, P.Z.S., 1865, 154; Man. Conch. (1), xiii, 56. *A. Petterdi*, T.-Woods, P. Roy. S. Tasm., 1876 (1877), 155; Man. Conch. (1), xiii, 54. *A. septiformis*, Q. & G., P. Mal. S., vii, 318; Verco, T.R.S. S.Aust., xxx, 215.

Shell oval, conical to depressed, radiating riblets distinct or nearly obsolete, sometimes tessellated with green and white. The *sculpture* is very variable; typically the shell is delicately radiately striated, but specimens occur which have acute, distant, and slightly granulose radiating riblets, whilst others show almost no trace of sculpture. The *colour* is brown, tessellated with green or white, but uniformly dark-brown examples are also met with. The *apex* is at about the anterior fourth, but very often submarginal or even marginal; it is pointed forward, and obtuse. *Inside* blue or whitish, lineolate with brown. In specimens from the Auckland Islands and Campbell Island the whole of the interior is bluish-black, a lighter band around the central area; it is beautifully iridescent with dark blue, quite an exception in this family. Margin sharp, usually with a brown border, which is sometimes banded with yellowish.

Length, 14 mm.; breadth, 12 mm.; height, 6 mm. Length, 15 mm.; breadth, 11 mm.; height, 7 mm. (from Auckland Islands). Length, 16·5 mm.; breadth, 12·5 mm.; height, 4 mm. (from Chicken Island).

The *dentition* is very similar to that of *A. fragilis*, Suter, P. Mal. S., vii, pl. 27, f. 12–14.

Type in the Mus. Hist. Nat., Paris.

Hab.—Chicken Island (C. Cooper); west coast of Manukau (C. Spencer); Heathcote Estuary (Iredale); Dunedin; Auckland Islands (Captains Hutton and Bollons); Campbell Island (Captain Bollons). On rocks between tide-marks. Found also in Australia and Tasmania. The type is from King George's Port, Western Australia.

Remark.—The variability of this species is very remarkable; the sculpture, the colour, and the shape differ to such an extent that it is no wonder it has received several specific names.

Subgen. 2. Collisellina, Dall, 1871.

Collisellina, Dall, Amer. Journ. Conch., vi, 1871, 154. Type: *A. saccharina*, L.

Muzzle without lappets; marginal teeth present, 2 on each side. Formula of teeth: 2 . 2 (1+0+1) 2 . 2.

14. Acmæa stella, Lesson, 1830. Plate 5, fig. 16.

Patella stella, Lesson, Voy. Coq., Zool., ii, 1830, 421. *Acmæa stella*, Suter, P. Mal. S., vii, 1907, 324, pl. 27, f. 36, 37.

Shell solid, depressed, irregularly oval, strongly ribbed, whitish, margin laciniate. The *sculpture* consists of 7 radiating angular ribs, rounded above, thick, separated by wide depressions, 3 in front, 4 behind the apex; in the interspaces between these main ribs there are 1 or 2 smaller ribs; all of these ribs strongly and irregularly denticulate the margin; strong concentric ridges are mostly present. *Colour* dirty-white or greenish, with black in double interrupted circles. *Apex* situate at the anterior third. *Inside* bluish-white; central area light brown or blue dotted with brown; the margin with a few dark-brown spots or a continuous brown border; tips of rays white.

Length, 21 mm.; breadth, 19 mm.; height, 6·25 mm. (type). Length, 21 mm.; breadth, 18 mm.; height, 5 mm. (specimen figured).

The *dentition* (Plate 1, fig. 1) consists of short, broad, rounded median and lateral teeth, and on each side posteriorly 2 elongated denticulate marginals.

Type (?).

Hab.—Heads of Wellington Harbour and Island Bay, Cook Strait (Miss Mestayer); Taumaki Island, in 10 fathoms (Captain Bollons); East Cape.

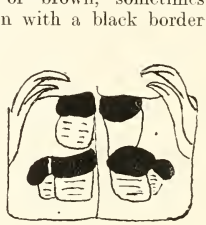
Remark.—This species is very closely allied to *A. costata*, Sow., of Australia and Tasmania.

Subsp. corticata, Hutton, 1880. Plate 5, fig. 17.

Acmæa corticata, Hutton, M.N.Z.M., 89. *A. lacunosa*, Reeve: Hutton, T.N.Z.I., xvi, 215; Pilsbry, Man. Conch. (1), xiii, 52, pl. 37, f. 7–11, not of Reeve. *A. stella*, subsp. *corticata*, Hutt.: Suter, P. Mal. S., vii, 325, pl. 27, f. 38–41.

Shell oval, conoidal, ribbed. There are 14 to 22 rounded, roughened radiate *ribs*, a few of them short, crossed by incremental ridges. *Colour* white, nearly always obscured by a layer of Nulliporites. *Apex* a little in front of the middle, obtuse; slopes straight; margin denticulate. *Inside* bluish-white, spatula white or brown, sometimes faintly radiately streaked with black; margin with a black border or dark-brown spots.

Length, 14 mm.; breadth, 13 mm.; height, 9 mm. (type). Length, 13 mm.; breadth, 9·5 mm.; height, 5 mm. (specimen figured).



Teeth of Radula.

Dentition.—Hutton, T.N.Z.I., xv, 127, pl. 15, f. L; P. Mal. S., vii, pl. 27, f. 41.

Type in the Canterbury Museum, Christchurch.

Hab.—The type is from Dunedin; North and South Islands; Chatham Islands.

Remark.—This subspecies is distinguished from the species by the usually smaller size, and the disappearance of the 7 primary, stronger ribs. The margin is not laciniate, and the ribs are more numerous and equal.

Subsp. pseudocorticata, Iredale, 1908.

Acmæa pseudocorticata, Iredale, T.N.Z.I., xl, 1907 (1908), 379.

Shell small, conical, elongate-oval, sides almost parallel, closely ribbed, greenish, with brownish markings between the ribs, margin almost entire. The *sculpture* consists of about 17 ribs in the young shell up to 30 in the older shell, due to divarication. *Apex* situated at about the anterior third to subcentral; almost always eroded, so that the sculpture is only distinct on the lower half of the older shells. Margin entire or feebly denticulate; very irregular in some specimens, due to their station. The *coloration* of the outside is constantly greenish, the interstices between the ribs brownish. The *spatula* is distinctly marked, of a pinkish colour; below is a darker shade of pink; the margin is white, marked with bluish-black lines corresponding to the interstices between the ribs. This coloration is almost constant; in some the spatula is whitish or yellowish-white or rarely spotted with black.

Measurements of a fair specimen are: Length, 13 mm.; breadth, 9 mm.; height, 6 mm. (Iredale.)

Animal unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—Lyttelton Harbour (type); Taylor's Mistake Bay; Shag Point, Otago; Otago Peninsula. On rocks, almost at high-tide mark.

I have not seen this shell.

15. Acmæa octoradiata, Hutton, 1873. Plate 7, fig. 6.

Patella octoradiata, Hutton, C.M.M., 44. *P. stellaris*, Q. & G.: Hutton, J. de Conch., xxvi, 37, non Quoy and Gaimard. *Acmæa saccharina*, L., var. *perplexa*, Pilsbry, Man. Conch. (1), xiii, 50, pl. 36, f. 69–71. *A. octoradiata*, Hutton: Hedley, P.L.S. N.S.W., 1904, 188; Suter, P. Mal. S., vii, 325; Verco, T.R.S. S.Aust., xxx, 209.

Shell depressed, star-shaped, whitish. There are 5 large rounded *ribs* behind and 3 in front of the apex, reaching far beyond the margin; they and their interspaces are all ornamented with fine radiate riblets. *Colour* white or creamy, with fine radiating reddish-brown lines. *Apex* at about the anterior third, obtuse. *Interior* white, with a few flesh-coloured spots; border very narrow, dotted with rufous; central area indistinct.

Length, 16 mm.; breadth, 14 mm.; height, 3 mm.

Dentition unknown.

Type in the Dominion Museum, Wellington.

Hab.—West coast of the South Island (type); Bluff (A. Hamilton); Chatham Islands. Also Tasmania and Australia.

Remark.—There can be but little doubt that this species belongs to *Collisellina*.

Fam. **PATELLIDÆ.** Guilding.

Docoglossate Gastropods breathing by a cordon of branchial leaflets attached to the mantle between its thickened edge and the sides of the foot; having no cervical gill-plume. Radula with 3 marginal and 3 lateral teeth on each side, the central tooth being either present, rudimentary, or wanting; jaw developed. They feed on algæ, and live mostly on rocks.

Shell conical, non-spiral even in the embryo.

The *Patellidæ* differ from the *Acmæidæ* in the gills, which form a complete or interrupted cordon, not accompanied by a cervical branchial plume, and not homologous with the gills developed in other *Streptoneura*.

The shells may generally be distinguished from those of the *Acmæidæ* by their texture and the lack of a defined internal border. The apex is, as in the *Acmæidæ*, subcentral or marginal, but always nearer the anterior margin; the central area and the muscle-scar are also similar in the two families.

Limpets.

This family dates back to the Ordovician, but is still found in the littoral zone of most seas.

KEY TO GENERA.

a. Shell very large, solid, opaque, not iridescent (Kermadec Islands) .. .. .. PATELLA (ANCISTROMESUS).
aa. Shell smaller, solid, interior iridescent or satiny.
b. Branchial cordon complete, interior with a metallic lustre .. .. .. NACELLA (PATINIGERA).
bb. Branchial cordon interrupted in front, inner layer subtranslucent, more or less iridescent .. .. .. HELCIONISCUS.

Subfam. 1. NACELLINÆ.

Developed lateral teeth, but 2 on each side, of which 1 is anterior.

Genus 1. NACELLA, Schumacher, 1817.

Nacella, Schumacher, Essai d'un nouv. Syst., 1817, 179. Type: *Patella mytilina*, Helb. *Nacella*, Dall, Amer. Journ. Conch., vi, 274; not *Nacella* of Carpenter, Sars, *et al.*

The gill-cordon is continuous; the foot is encircled by a scalloped epipodial ridge, interrupted in front. One inner lateral tooth on each side anterior; central tooth none, or rudimentary. The shell has the apex subcentral or anterior, and is characterized by a peculiarly metallic texture, having the central area of the interior generally of a red-bronze colour.

Cape Horn was evidently the birthplace of *Nacella* and *Patinigera*. Thence they have been distributed eastward to the Falkland, New Georgia, and Kerguelen Islands by the eastward-sweeping antarctic current carrying them upon seaweeds. (Pilsbry.)

KEY TO SPECIES.

a. Shell elevated conical, 20–25 distant radiate ribs, with 1–3 intervening striæ .. .. *illuminata.*
aa. Shell compressly raised, 30–60 radiate riblets, crossed by close undulating ridges .. .. *fuegiensis.*

Sect. PATINIGERA, Dall, 1905.

Patinella, Dall, Amer. Journ. Conch., vi, 1871, 272 (preoccupied). *Patinigera*, Dall, "The Nautilus," xviii, 1905, 113. Type: *Patella magellanica*, Gmel.

1. Nacella fuegiensis, Reeve, 1855. Plate 7, fig. 7.

Patella fuegiensis, Reeve, Conch. Icon., Patella, f. 73. *Patella (Patinella) fuegiensis*, E. A. Smith, Trans. Roy. Soc., 1879, 14, pl. 9, f. 14, 14*a*; Rochebrune and Mabille, Miss. Sci. du Cap Horn, 95; Filhol, Miss. I.C., 529; Deutsche Tiefsee Exp. "Valdivia," A, 72. *Nacella fuegiensis*, Reeve; Pilsbry, Man. Conch. (1), xiii, 121, pl. 49, f. 28–31; Suter, P. Mal. S., vi, 353; Subantarct. Islds. N.Zeal., i, 6.

Shell oval, rather thin, semitransparent, compressly raised. *Sculpture* consists of 30 to 60 ribs, densely crossed by beautiful raised and undulating concentric ridges. *Colour* brown or greenish, more or

less stained and blotched with chestnut-brown, apex bronze. *Apex* inclined anteriorly, situate at about the anterior fifth, anterior slope straight to concave. *Interior* iridescent bronze, radiately grooved, grooves sometimes partially obsolete.

Length, 33 mm.; breadth, 24 mm.; height, 9 mm.: Length, 31 mm.; breadth, 23 mm.; height, 13 mm. (specimens from Macquarie Island).

Dentition.—Teeth of the lingual ribbon slightly hooked, in pairs, scarcely diverging; the central pair 2-pronged, the inner prong much larger, spear-head shaped; the lateral pairs alternating with the central ones are 4-pronged, the innermost prong smallest, the next 2 subequal, and the outside one situated nearly at right angles to the rest of the tooth, about the same size or a trifle larger. (E. A. Smith.)

Type in the British Museum.

Hab.—Campbell Island (Filhol); Macquarie Island (A. Hamilton). Tierra del Fuego, Falkland Islands, Kerguelen Island; everywhere common on the submerged fronds of floating kelp (*Macrocystis*).

Remarks.—The radiate ribs are very variable in size and number; in one specimen I have they coalesce to broad ribs, having now and again a fine riblet between them. The crowded, strongly raised, and undulating concentric ridges are characteristic of the species. Most of the shells are covered with Nulliporites.

2. Nacella illuminata, Gould, 1846. Plate 7, fig. 8.

Patella illuminata, Gould, P. Bost. S.N.H., ii, 1846, 149. *Nacella illuminata*, Gould, U.S. Expl. Ex., 340, atlas f. 441. *Patinella illuminata*, Gould: Hutton, P.L.S. N.S.W., ix, 376. *Helcioniscus illuminata*, Gould: Pilsbry, Man. Conch. (1), xiii, 142, pl. 70, f. 40–42. *Nacella illuminata*, Gould: Suter, P. Mal. S., vi, 353; Subantarct. Islds. N.Zeal., i, 6. *Patella terroris*, Filhol, Compt. Rend., xci, 1880; Miss. I.C., 529.

Shell elevated conical, ovate, arched. Surface covered with numerous small obtuse radiating *riblets*, numbering 20 to 25, with from 1 to 3 intervening striæ; concentric lines of growth crowded, very faint. *Colour* sooty, with scattered yellowish spots, about 20 in number, somewhat regularly disposed, which are transparent when held up to the light, those near the margin elongated. *Apex* at about the anterior fourth or third, sharp, directed forward. *Interior* a very dark claret colour, with brilliant silky and golden reflections, and yellow spots, corresponding to those of the exterior; central area dull buff colour.

Length, 38 mm.; breadth, 32; height, 16 mm.

Dentition.—Hutton, T.N.Z.I., xv, 128, pl. 16, f. C. Plate 1, fig. 2, is a copy.

Animal.—The foot has on its sides a scalloped frill, interrupted in front; the branchial cordon is complete, not interrupted in front,

and the branchial papillæ are elongated conical, transversely foliated; larger black lamellæ are placed at regular intervals, leaving 2 or 3 white papillæ between them, and they have their base of insertion higher up, on the inner side of the mantle.

Type in the U.S. National Museum, Washington.

Hab.—Antipodes Islands, Auckland Islands (type), Campbell Island, and Macquarie Island.

Remarks.—In specimens from the Auckland Islands the radiate ribs are sometimes quite obsolete. Very often this species shows a certain likeness with *Helcioniscus strigilis* by having the inside rayed with dark brown and yellow, but it may be separated by the presence of the metallic lustre.

Genus 2. Helcioniscus, Dall, 1871.

Helcioniscus, Dall, Amer. Journ. Conch., vi, 1871, 227. Type: *Patella variegata*, Reeve. *Helcioniscus*, Thiele, in Troschel's "Gebiss der Schnecken," ii, 333 (full discussion and figures of the dentition); Man. Conch. (1), xiii, 80, 123, 172. *Cellana*, H. Adams, P.Z.S., 1869, 274; type, *Nacella cernica*, H. Ad.

The gill-cordon is interrupted in front, and there are no epipodial processes or ridge on the sides of the foot. The formula of teeth is 3 ($1^{111}1$) 3. The radula is long and spirally rolled. The central tooth is narrow, with a variously shaped forward appendage. The inner lateral has typically an outward wing, and a simple long cusp; the outer lateral has an inner long point with an outer side cusp, besides a short mostly rounded longitudinal cutting-edge. The marginal teeth are characteristic, the posterior part being divided from the anterior, the connection thin and almost imperceptible. The inner marginal tooth has a cusp on its front end.

The shell is conical, the apex subcentral or subanterior; inside with a silvery and mica-like lustre.

Distribution.—Indian and Pacific Oceans, but not found on the American shores north of Chili. No species have been found in the Atlantic Ocean.

Key to Species.

A. Ribs almost smooth.

a. 20–25 separated narrow principal ribs, with 1 or more interstitial riblets, cut up into fine granules in front of apex; with divaricating white or reddish-brown blotches, or uniformly yellow, olive, or grey; apex anterior .. .. *radians.*

b. Shell usually large, obliquely conical, 20–30 low distant ribs; colour brown; apex at anterior third to eighth; interior blackish-purple or light brown, with dark-brown rays .. .. *strigilis.*

c. Shell depressed to conoidal, ribs 20–30, brown, interstices often bluish-white; apex anterior .. .. *rediniculum.*

B. Ribs distinctly granular.
- *a.* Ribs 22–30, scale-granose; apex at anterior fourth; spatula orange-brown .. .. *denticulatus.*
- *b.* Ribs crenulate to granose, about 40 principal ribs, 1 interstitial riblet, with radiate black stripes; apex in front of centre; interior with dark rays and spots; spatula yellow to brown .. .. *antipodum.*
- *c.* Ribs granular; colour reddish to black, white radiating rays form a star or extend to margin .. .. *stelliferus.*
- *d.* Ribs coarsely nodular; apex at anterior third; intermediate riblets sometimes dotted with black and white; interior brown, with 11–12 white rays .. *ornatus.*
- *e.* Shell small, subpellucid; 24–30 granular ribs; blackish-brown or yellowish-grey, and ribs alternately black or uniformly flesh-colour; apex at anterior third. Kermadec Islands only .. .. *craticulatus.*

1. Helcioniscus antipodum, E. A. Smith, 1874. Plate 7, fig. 9.

Patella antipodum, E. A. Smith, Ereb. & Ter., Moll., 1874, 4, pl. 1, f. 25. *P. tramoserica* of authors, not of Martyn, 1784; Pritchard and Gatliff, P.R.S. Vic. (n.s.), xv, 191. *Helcioniscus diemenensis*, Philippi: Gatliff and Gabriel, *op. cit.* (n.s.), xxi, 382.

Shell rotundately ovate, a little narrowed in front; the *apex* much inclined anteriorly, placed at a distance of one-fourth of the entire length from the front margin; radiately rather finely *ribbed*, ribs crossed by the fine concentric lines of growth; *orange-yellow*, clouded with white around the middle, varied with 10 or 11 black narrow rays placed at nearly equal distances, those in front being rather more approximated than the rest; the *interior* is brilliant pearly orange-yellow, the exterior black rays being visible, especially at the margin, which is finely crenulated. (E. A. Smith.)

Length, 28 mm.; width, 22 mm.; height, 9 mm. Length, 31 mm.; width, 24 mm.; height, 16 mm. (Hauraki Gulf specimen).

Type in the British Museum.

Hab.—New Zealand (Lieut.-Colonel Bolton); Hokianga; Hauraki Gulf (H. S.); Wellington and Chatham Islands (*fide* Hutton); Kermadec Islands (Haylock). Tasmania and Australia?

Remarks.—Gatliff and Gabriel state that the Australasian species generally known as *P. tramoserica*, Martyn, is not the shell figured by Martyn, and that he mentions the north-west coast of America as the habitat of his species; they therefore adopt the name *P. diemenensis*, Philippi, 1848. Replying to my inquiry, Dr. W. H. Dall most obligingly informed me that (1) Martyn's figure, which is good, does positively not represent any north-west American species; (2) that *P. diemenensis* is an unfigured and doubtful species; (3) if bent on changing the name, it would be better to take *Patella antipodum*, E. A. Smith, 1874, which is a synomyn of the *tramoserica* of authors, not Martyn. I follow here Dr. Dall's excellent advice, as in

so doing we are dealing with a well-described and figured species which undoubtedly belongs to the New Zealand fauna. There is no absolute proof that our species is identical with the very similar shell from Tasmania and Australia. Species of the *Patellidæ* have usually a very limited range of distribution.

2. Helcioniscus denticulatus, Martyn, 1784. Plate 7, fig. 10.

Patella denticulata, Mart., Univ. Conch., ii, f. 65; Hutton, M.N.Z.M., 109. *Patinella denticulata*, Mart.: Hutton, P.L.S. N.S.W., ix, 375. *Helcioniscus denticulatus*, Mart., Man. Conch. (1), xiii, 138, pl. 21, f. 49, 50; pl. 68, f. 23, 24. *Patella imbricata*, Reeve, Conch. Icon., f. 95, not of Linné. *P. Reevei*, Hutton, M.N.Z.M., 108. *Patinella Reevei*, Hutton, P.L.S. N.S.W., ix, 376. *Helcioniscus denticulatus*, Mart.: Suter, P. Mal. S., vi, 346. *Patella margaritaria*, Chemn.: Martens, Crit. List, 36, not of Chemnitz.

Shell solid, oval elevated. The *sculpture* consists of 22 to 30 principal radiate ribs, and some smaller interstial riblets, all of which are closely scale-granose; this character, however, is often lost in old shells through the dissolving action of the water. *Apex* more or less anterior, usually at the anterior fourth. *Colour* varies from light grey with brown ribs to dark brown. *Interior* bluish, central area well defined, orange-brown; muscle-scar sometimes raised, bluish-white; space between central area and margin bluish-white, with dark-brown bands corresponding to the ribs; interspaces dotted with yellow spots; margin with dark-brown triangular spots; highly iridescent.

Length, 55 mm.; breadth, 43 mm.; height, 24 mm. Length, 45 mm.; breadth, 37 mm.; height, 15 mm.

Dentition.—The inner lateral tooth has a simple long cusp, and the outer lateral has one denticle at the outer edge.

Hab.—Cook Strait; East Cape. Hutton also mentions Dunedin and the Chatham Islands.

Remarks.—Brought to England by Captain Cook. This species is very local, but plentiful where it occurs.

3. Helcioniscus ornatus, Dillwyn, 1817. Plate 7, fig. 11.

Patella ornata, Dillw., Descript. Cat. Rec. Shells, ii, 1029. *Helcioniscus ornatus*, Dillw., Man. Conch. (1), xiii, 137, pl. 19, f. 39, 40; pl. 68, f. 14–19; Suter, P. Mal. S., vi, 351. *Patella nodosa*, H. & J., Ann. Sci. Nat. (2), xvi, 191. *P. denticulata*, Mart.: E. A. Smith, Ereb. & Ter., Zool., ii, Moll., 4, pl. 1, f. 26; Hutton, P.L.S. N.S.W., ix, 375, not of Martyn. *P. margaritaria*, Chemn.: Reeve, Conch. Icon., f. 74.

Shell solid, oval or oblong, low conical. *Sculpture* consisting of larger radiating coarsely nodular ribs, about 11 in number, with a somewhat smaller rib between each pair of larger ones, the intervals radiately striated; growth-striæ fine, often quite distinctly cutting the radial striæ. The larger ribs are light, the intermediate ribs

are black dotted with white, especially in the young, this colouring being less obvious on large shells. *Apex* at about the front third, erect. *Interior* having alternating silvery and black rays, the latter usually 11 in number; the large central area black, suffused more or less with cream colour in the depth of the apex. (Pilsbry.)

Length, 32 mm.; breadth, 25 mm; height, 10 mm.

Dentition.—Hutton, T.N.Z.I., xv, 128, pl. 16, f. B (*P. denticulata*).

Type (?).

Hab.—Throughout New Zealand, but more common in the south.

Remark.—This species is very well characterized, and does not show any very great variability, except that the apex is sometimes quite anterior.

Subsp. **inconspicuus**, Gray, 1843. Plate 7, fig. 12.

Patella inconspicua, Gray, Dieff. N.Z., ii, 244; Hutton, M.N.Z.M., 107; P.L.S. N.S.W., ix, 375. *Helcioniscus ornatus*, Dillw., var. *inconspicua* (Gray), Hutton, Man. Conch. (1), xiii, 138, pl. 68, f. 20–22; Suter, P. Mal. S., vi, 351. *Patella luctuosa*, Gould, P. Bost. S.N.H., ii, 150, not of Hombr. & Jacq.

Shell conical, high, the height often more than half the length. *Sculpture* similar to that in the species, about 20 radiating ribs. *Colour* light grey to dark brown, intermediate ribs without black and white dots. *Apex* subcentral to the front third. *Interior* dark brown, with 11 white rays; central area dark brown, much lighter under the apex.

Length, 32 mm.; breadth, 25 mm.; height, 17 mm. Length, 40 mm.; breadth, 31 mm.; height, 16 mm. Length, 24 mm.; breadth, 19 mm.; height, 16 mm.

Animal.—Hutton, T.N.Z.I., xiii, 203.

Type in the British Museum.

Hab.—Throughout New Zealand. One of the common limpets.

4. **Helcioniscus radians**, Gmelin, 1790. Plate 7, fig. 13.

Patella radians, Gmel., Syst. Nat., ed xiii, 1790, 3720 *P. argyropsis*, Lesson, Voy. Coq., 419. *P. pholidota*, Lesson, *t.c.*, 420. *P. radiatilis*, Hombron and Jacquinot, Ann. Sci. Nat. (2), xvi, 191. *P. sturnus*, H. & J., *t.c.*, 191. *P. fusca*, L., Syst. Nat., ed. x, 784 (defined in an absurdly inadequate manner). *P. sagittata*, Donovan: Rees, Encyclop. Conchol., xvi. *P. floccata*, Reeve: Hutton, M.N.Z.M., 108, not of Reeve. *Helcioniscus radians*, Gmel., Man. Conch. (1), xiii, 139, pl. 23, f. 4–8; pl. 69, f. 25–39: Suter, P. Mal. S., vi, 347.

Shell ovate, depressed, thin but solid, slightly narrower in front. Surface sculptured with decidedly separated narrow radiating riblets, 20 to 25, having a number of smaller riblets (sometimes obsolete) in each interval, and decussated by fine crowded growth-striæ, also often obsolete, but usually cutting the surface just in front of the

apex into fine granules. *Colour* bluish-white, usually buff around the apex, striped in a divaricating pattern, or irregularly blotched and rayed down the ribs with brown or olive. *Apex* not prominent, at the anterior fourth or fifth. *Interior* buffish-olive, with a silvery lustre, showing the colour-markings of the outside, having a white or brown central callus, often ill defined. (Pilsbry.)

Length, 44 mm.; breadth, 34 mm.; height. 8 mm. (typical form).

Dentition.—Hutton, T.N.Z.I., xv, 129, pl. 16, f. E.

Anatomy.—J. A. Newell, T.N.Z.I., xix, 157, pl. 11.

Hab.—Throughout New Zealand, but more common on the east coast of the North Island.

Remark.—This also is a very variable shell, especially in the colour-pattern.

Subsp. **argenteus**, Quoy and Gaimard, 1834. Plate 7, fig. 14.

Patella argentea, Q. & G., Voy. Astrol., Zool., iii, 345, pl. 70, f. 16, 17. *Nacella argentea*, Quoy: Hutton, C.M.M., 45. *Helcioniscus radians*, Gmel., subsp. *argentea*, Q. & G.: Suter, P. Mal. S., vi, 347.

The *shell* has most of the characters of the species, but the interior has no brownish radiate bands. The surface is *sculptured* by about 20 more or less elevated ribs, with several interstitial riblets. The main ribs are light brown, sometimes punctured with white; the ground-colour is greenish or grey, often blotched with white; the nacre is silvery-white, frequently with a yellowish tint; central area greyish-white or cream colour, rusty in old examples. The shell is generally much more elevated than the species.

Length, 24 mm.; breadth, 22·5 mm.; height, 6·8 mm. (type). Length, 50 mm.; breadth, 41 mm.; height, 21 mm. (specimen from Sumner). Length, 42 mm.; breadth, 34 mm.; height, 15 mm. (specimen from Napier). Length, 53 mm.; breadth, 44 mm.; height, 17 mm. (specimen from Timaru).

Dentition the same as in the species.

Type in the Mus. Hist. Nat., Paris.

Hab.—Throughout New Zealand; most common on the east coast of the South Island.

Subsp. **decorus**, Philippi, 1848. Plate 7, fig. 15.

Patella decora, Phil., Zeitschr. f. Malak., 1848, 162; Abbild., pl. 3, f. 3; Martens, Crit. List., 35. *Helcioniscus radians*, Gmel., subsp. *decora*, Phil.: Suter, P. Mal. S., vi, 348.

Shell mostly large, semiglobose. *Apex* much inclined to the anterior, more rounded than in the typical species, with 20–24 distant reddish-brown ribs on a yellowish or greenish-olive ground. *Interior*

iridescent, with the brown radiating ribs shining through the pearly layer; central area milk-white to greyish-olive.

My largest specimen, from Tauranga, has the following dimensions: Length, 60 mm.; breadth, 50 mm.; height, 18 mm.

The *dentition* is unknown.

Hab.—East coast of both Islands; not common.

Subsp. **Earlii**, Reeve, 1855. Plate 7, fig. 16.

Patella Earlii, Reeve, Conch. Icon., f. 71. *Nacella Earlii*, Reeve: Hutton, C.M.M., 45. *Patinella Earlii*, Reeve: Hutton, P.L.S. N.S.W., ix, 376. *Helcioniscus Earlii*, Reeve, Man. Conch. (1), xiii, 140, pl. 21, f. 51, 52. *H. radians*, Gmel., subsp. *Earlii*, Reeve: Suter, P. Mal. S., vi, 348. *Patella flexuosa*, Hutton, C.M.M., 45, not of Quoy and Gaimard.

Distinguished from the species by the rounded-oval form, the convexly raised front, the broad blood-red blotches, and the milk-white central area. This is a very distinct and easily recognised subspecies. The altitude is generally not greater than in the species, but the breadth is much greater in proportion to the length.

Length, 60 mm.; breadth, 50 mm.; height, 16 mm. (specimen from Tauranga). Length, 50 mm.; breadth, 42 mm.; height, 16 mm. Length, 47 mm.; breadth, 39 mm.; height, 11 mm. (both from Te Onepoto).

Dentition the same as in the species.

Type in the British Museum.

Hab.—Along the east coast of both Islands: Tauranga; Te Onepoto and Sumner, near Lyttelton; Akaroa; Timaru; Preservation Inlet. Chatham Islands.

Subsp. **affinis**, Reeve, 1855. Plate 7, fig. 17.

Patella affinis, Reeve, Conch. Icon., f. 108. *Helcioniscus affinis*, Reeve, Man. Conch. (1), xiii, 140, pl. 69, f. 32, 33. *H. radians*, Gmel., subsp. *affinis*, Reeve: Suter, P. Mal. S., vi, 349. *Nacella Earlii*, Reeve: Hutton, C.M.M., 45 (according to specimens in the Dominion Museum), non Reeve. *Acmæa chathamensis*, Pilsbry, Man. Conch. (1), xiii, 1891, 56, pl. 35, f. 43–46; Suter, P. Mal. S., vii, 1907, 326.

Distinguished from the species by its smaller size, the elongated-oval form, the numerous simple, smooth, slightly waved radiate ridges and striæ. The typical, close, divaricating colour-pattern is not always present; sometimes there are only brown radiate bands visible, which, especially in Chatham Island examples, coalesce, forming broad dark-brown or black patches. The concentric striation is mostly very distinct.

Length, 33 mm.; breadth, 27 mm.; height, 7 mm. (specimen from Stonyhurst). Length, 27 mm.; breadth, 20 mm.; height, 6·5 mm. (specimen from Chatham Islands).

Dentition the same as in the species.

Type in the British Museum.

Hab.—Ngunguru Harbour; Stonyhurst; Te Onepoto; Preservation Inlet; Chatham Islands; Disappointment Island, Auckland Group (Captain Bollons).

Remarks.—An exceedingly variable subspecies, but always more elongated than the species. Pilsbry's *Acmæa chathamensis* is one of the extreme forms of the subspecies.

Subsp. **flavus**, Hutton, 1873. Plate 7, fig. 18.

Patella flava, Hutt., C.M.M., 44. *Patinella flava*, Hutton, P.L.S. N.S.W., ix, 378. *Helcioniscus flavus*, Hutt., Man. Conch. (1), xiii, 142. *H. radians*, Gmel., subsp. *flava*, Hutt.: Suter, P. Mal. S., 349.

This subspecies is best described as a conical, pale-yellow form of *decorus*, Phil. The *apex* is subcentral, sometimes nearly reaching the anterior third of the length. Small shells are, as a rule, depressed, but adult specimens have mostly a high conical form. The distant broadly rounded *ribs* number 20 to 22, and are almost always of the same colour as the shell; specimens from Stonyhurst have sometimes one or several ribs dark brown. *Interior* light to orange-yellow, iridescent, central area light orange to cream colour.

Length, 55 mm.; breadth, 46 mm.; height, 26 mm. (specimen from Kaikoura). Length, 50 mm.; breadth, 42 mm.; height, 22 mm. (specimen from Stonyhurst). Length, 45 mm.; breadth, 37 mm.; height, 18 mm. (specimen from Napier).

Type in the Dominion Museum, Wellington.

Hab.—South Island: Stonyhurst; Amuri Bluff (type); Motanau Island; Kaikoura. North Island: Napier; Gisborne; East Cape. Chatham Islands.

Subsp. **olivaceus**, Hutton, 1882. Plate 7, fig. 19.

Patella olivacea, Hutt., N.Z.J.S., i, 1882, 69. *Patinella radians*, Gmel., var. *olivacea*, Hutton, P.L.S. N.S.W., ix, 377. *Helcioniscus olivaceus*, Hutt., Man. Conch. (1), xiii, 141, pl. 70, f. 46–48. *H. radians*, Gmel., subsp. *olivacea*, Hutt.: Suter, P. Mal. S., vi. 349.

This subspecies is very much like the large conical form of *argenteus*, Q. & G., but distinguished from it chiefly by the very numerous (about 70) fine and uniform radiate riblets, the olive colour of the shell, and the black margin on the inner edge, which, however, is not a constant character.

Length, 33 mm.; breadth, 28 mm.; height, 14 mm.

Dentition.—Hutton, T.N.Z.I., xv, 128, pl. 16, f. D.

Type in the Canterbury Museum, Christchurch.

Hab.—From Sumner, near Lyttelton, along the east coast to Preservation Inlet, South Island. Rather rare, but always together with *argenteus*, Q. & G.

Subsp. **Mestayeræ**, Suter, 1906.

Helcioniscus Mestayeræ, Sut., T.N.Z.I., xxxviii, 1905 (1906), 322, pl. 18, f. 7–9.

Shell solid, oval, slightly narrower in front, depressed conical. Surface *sculptured* with numerous (about 50) broad depressed radiating ribs, which are crossed by fine concentric striæ. *Colour* dark olive, with rather distant indistinct bluish-grey radiating bands. *Apex* at about the front fourth, sharply pointed. *Interior* bluish-grey, with a silvery lustre. There are at irregular intervals about 11 broad radiating areas, with chestnut-coloured spots and patches, sometimes arranged in divaricating pattern; between these areas are several radiating bands of an alternately darker and lighter grey colour. These characters are very distinctly visible when the shell is held up against the light, and give it a very beautiful appearance. The central area is well defined; the colour is reddish-orange, lighter near the margin, finely and minutely dotted with yellow. The muscular scar is about 3 mm. broad, but slightly impressed.

Length, 49 mm.; breadth, 39 mm.; height, 14 mm.

The *dentition* is unknown.

Type in Miss Mestayer's collection.

Hab.—Stewart Island.

5. **Helcioniscus redimiculum**, Reeve, 1854. Plate 7, fig. 20.

Patella redimiculum, Rve., Conch. Icon. (1854), f. 50. *Patinella redimiculum*, Rve: Hutton, P.L.S. N.S.W., ix, 375. *Helcioniscus redimiculum*, Rve., Man. Conch. (1), xiii, 136, pl. 23, f. 1, 2, 3, 5; Suter, P. Mal. S., vi, 351. *Patella redimiculum*, Rve.: E. A. Smith, Ereb. & Ter., ii, Moll., 4, pl. 1, f. 24. *P. radians*, Gmel., Conch. Icon., f. 25, not of Gmelin. *P. Pottsi*, Hutton, C.M.M., 1873, 44.

Shell elongate to round oval, depressed to conical. *Sculptured* with 20 to 25 rounded, distant, and elevated radiate ribs, with a low interstitial riblet, the whole surface ornamented with fine close concentric growth-lines, some of the growth-periods being usually strongly marked. *Colour* of the ribs brown, lighter towards the margin, intervals bluish-white; having several darker concentric streaks, and marked near the apex with oblique brown stripes. Very frequently the colour is uniformly cinereous or brown, with the ribs more or less darker. *Apex* at about the front fourth, but sometimes it is submarginal; inclined forward. *Interior* greyish to brownish-white, strongly iridescent, more or less distinctly rayed with chestnut-brown; central area cream-white, bordered with olive behind, often light brown or bluish-grey to light blue. Margin broadly denticulate.

Length, 41 mm.; breadth, 32 mm.; height, 12 mm. Length, 49 mm.; breadth, 40 mm.; height, 20 mm. (specimen from Otago). Length, 58 mm.; breadth, 47 mm.; height, 23 mm. (specimen from Preservation Inlet). Length, 41 mm.; breadth, 29 mm.; height, 12 mm. (specimen from Bounty Islands).

Dentition very much like that of *H. denticulatus*.

Type in the British Museum.

Hab.—Eastern shores of the South Island, from Stonyhurst to Preservation Inlet; Chatham, Bounty, and Auckland Islands.

Remarks.—This also is a variable species, the elevation of the apex sometimes approaching that of a somewhat depressed *H. strigilis*. The two are very nearly allied.

6. Helcioniscus stelliferus, Gmelin, 1790. Plate 7, fig. 21.

Patella stellifera, Gmel., Syst. Nat., ed. xiii, 3719. *Patinella stellifera*, Hutton, P.L.S. N.S.W., ix, 378. *H. stellifera*, Gmel., Man. Conch. (1), xiii, 141, pl. 70, f. 43–45; Suter, P. Mal. S., vi, 350; Iredale, T.N.Z.I., xl, 380. *Patella stellularia*, Quoy and Gaimard, Voy. Astrol., Zool., iii, 1834, 347, pl. 70, f. 18–20.

Shell depressed oval, reddish or black, with granular ribs. *Sculptured* by numerous radiate ribs, of which about 10 to 20 are more elevated than the others; all the ribs are cut up into granules by strong concentric furrows. Sometimes the ribs are more equal, but the concentric sculpture is always prominent. *Colour* usually reddish, but often black, brown, or cinereous; there are white rays at the apex, forming a star, but they frequently extend to the margin, and sometimes they are altogether absent. *Apex* at the anterior third or fourth. *Interior* white, cinereous or greyish-brown, showing all the white star-shaped rays; iridescent in fresh specimens; central area not well defined, chestnut-brown.

Length, 25 mm.; breadth, 19 mm.; height, 7 mm. Length, 32 mm.; breadth, 27 mm.; height, 11 mm.

Dentition unknown.

Hab.—Cape Maria van Diemen; Bay of Islands (J. C. Anderson); Lyall Bay to Island Bay, Cook Strait; Queen Charlotte Sound, in 6 fathoms (Captain Bollons); Nelson; New Brighton; Campbell Island, on rocks (Captain Bollons). Brought to England by Captain Cook.

Subsp. phymatius, Suter, 1905. Plate 5, fig. 18.

Helcioniscus stelliferus, Gmel., subsp. *phymatius*, Suter, P. Mal. S., vi, 350, fig. in text.

Distinguished from the species by the high conical form and the strongly nodulous ribs. The *shell* is solid, oval or oblong, high conical, the height somewhat less than half the length of the shell. *Apex* at about the front third, more or less denuded. There are about 24 strongly nodulous radiate *ribs*, crossed by strong concentric lines of growth. As in the species, a white star or white bands extending to the margin are present, and the *colour* is yellowish-red. The anterior slope is straight or slightly convex. *Interior* silvery-white; central area white, sometimes tinged with light brown.

Length, 27 mm.; breadth, 21 mm.; height, 12 mm.

Type in my collection.

Hab.—Cook Strait; Banks Peninsula (Iredale); Bay of Islands.

7. **Helcioniscus strigilis,** Hombron and Jacquinot, 1841. Plate 7, fig. 22.

Patella strigilis, H. & J., Ann. Sci. Nat. (2), xvi, 1841, 190. *Patinella strigilis*, H. & J.: Hutton, P.L.S. N.S.W., ix, 374. *Helcioniscus strigilis*, H. & J., Man. Conch. (1), xiii, 137; Suter, P. Mal. S., vi, 351.

Shell oval, convex, obliquely conical. *Sculpture* consists of 20–30 low radiating ribs, with a short interstitial rib, often obsolete, crossed by distinct concentric growth-lines. *Colour* blackish-rufescent above, brownish-rufescent below; very often greenish or grey, with the ribs light brown. *Apex* at the front third to eighth, obtuse, sometimes whitish. *Interior* typically blackish-purple, iridescent, sometimes greyish-brown, with brown rays corresponding to the exterior ribs; central area well defined, cream colour to light brown; muscle-scar sometimes much raised and tuberculate. Margin broadly denticulate.

Length, 65 mm.; breadth, 50 mm. (type). Length, 80 mm.; breadth, 68 mm.; height, 39 mm. (specimen from Campbell Island). Length, 64 mm.; breadth, 51 mm.; height, 34 mm. (specimen from Auckland Islands). Length, 42 mm.; breadth, 35 mm.; height, 21·5 mm. (specimen from Preservation Inlet). Length, 60 mm.; breadth, 48 mm.; height, 24 mm. (specimen from Tauranga).

Dentition.—Hutton, T.N.Z.I., xv, 128, pl. 16, f. A (*P. magellanica*).

Type in the Mus. Hist. Nat., Paris ?

Hab.—From Tauranga to the Bluff. Chatham Islands; Antipodes Islands; Auckland Islands (type); Campbell Island; Snares.

Remark.—The elevation of the shell and the situation of the apex are variable, as is also the colouring of the interior.

Suborder 2. RHIPIDOGLOSSA.

Aspidobranchia with a pallio-visceral anastomosis; eye with a crystalline lens; a single osphradium, except in genera with 2 ctenidia; 1 or 2 hypobranchial glands. Mandibles paired, lateral. Radula characterized by—(1.) The extraordinary development of the uncini, of which there are so many that they are always reckoned as indefinitely numerous; they are long, narrow, hooked, and often cusped at the top, and crowded together like the ribs of a fan, those at the extreme edge not being set straight in the row, but curving away backwards as they become smaller. (2.) The varying number of the laterals; the average number of these is 5 on each side, varying from 3 to 9; the lateral next to the uncini is specially large. Taking 5 as the average number of laterals, the rhipidoglossate formula of teeth is $\infty 5.1.5 \infty$. Heart with 2 auricles; ventricle traversed by the rectum, except in the *Helicinidæ*. An epipodial ridge on each side of the foot, and cephalic expansions between the tentacles often present.

Fam. **SCISSURELLIDÆ**, Pilsbry.

Animal with a rather long rostrum, long ciliated tentacles, the eyes at their outer bases ; foot rather narrow ; epipodium bearing 4 ciliated cirri on each side. Radula with 1 central and 5 lateral teeth with large expanded basal plates and finely denticulate recurved cusps, the outer laterals hooked ; uncini numerous, narrow, with serrate cusps.

Shell minute, unicoloured, umbilicated, turbinate or depressed, few-whorled, thin, with a thin layer of pearl inside ; aperture oval, outer superior lip with a foramen or slit, and with a differently sculptured band or anal fasciole encircling the whorls. Operculum circular, corneous, thin, multispiral, with central nucleus.

The foramen or slit corresponds to the end of the rectum, and serves for the expulsion of the fæces.

The fossil (Tertiary) species number about as many as the Recent. A group of very small shells, most of them living in deep water, and widely distributed. The shell has a considerable resemblance to that of *Pleurotomaria*, but the dentition and external anatomy of the animal is decidedly nearer *Trochidæ*.

Key to Genera.

a. Shell with an open anal slit	Scissurella.
b. Anal fissure closed, forming a foramen	Schismope.

Genus 1. Scissurella, A. d'Orbigny, 1823.

Scissurella, d'Orb., Mem. Soc. Hist. Nat. Paris, i, 1823, 340. Type : *S. lævigata*, d'Orb. *Anatomus*, Ad., G.R.M., i, 439 ; not of Montfort, 1810. *Schizotrochus*, Monterosato, Nom. Gen. e Spec., 1884, 39. *Scissurella*, Fischer, Man. de Conch., 846 ; Man. Conch. (1), xii, 49.

Shell with an open anal slit, extending backward from the peristome ; slit fasciole extending nearly to the apex. Slit fasciole edged on either side by an upturned rim ; spiral sculpture is always present. The animal is active.

From Tertiary to Recent.

Vernacular Name.—Slit-shell.

Key to Species.

a. Shell turbinate, strongly keeled, surface decussate	*Mantelli*.
b. Shell auriform, with spiral threads	*rosea*.

1. Scissurella Mantelli, Woodward, 1859. Plate 6, fig. 10.

Scissurella Mantelli, Woodward, P.Z.S., 1859, 202, pl. 46, f. 8 ; Hutton, M.N.Z.M., 103 ; Man. Conch. (1), xii, 54. pl. 57, f. 12.

Shell small, turbinate. Spiral *sculpture* formed by a strong double keel at the periphery, enclosing the anal fasciole ; above and below it numerous close spiral striæ, more distinct on the base ; there are

distant elevated radiating riblets, crossing the fasciole, and decussating the whole surface. *Spire* depressed, tabulated. *Aperture* oblique. *Columella* concave, slightly callous. *Anal slit* on the outer lip deep and narrow.

Type in the British Museum.

Hab.—Found among ironsand from New Zealand (W. Mantell).

I have not seen this species.

Fossil in the Pliocene.

2. **Scissurella rosea,** Hedley, 1904. Plate 6, fig. 11.

Scissurella rosea, Hedley. Rec. A.M., v, 1904, 90, f. 17 in text.

Shell auriform, thin, translucent, narrowly perforate, spire slightly elevate. *Sculpture:* Above, close fine spiral threads; below, sharp distant spiral keels, both crossed by faint growth-lines. *Colour* white, with apex rose. *Protoconch* delicately longitudinally ribbed. *Whorls* 3, last spreading and flattened above, earlier rounded. *Aperture* large, oblique, oval. *Columella* concave, broad, extending a median lobe over the steep and narrow umbilicus. *Slit* deep, situated well above the periphery, and leading to a fasciole, which is not crossed by lamellæ, but edged with low smooth keels, and tapers to the termination, half a whorl back.

Diameter—Maj., 1·35 mm.; min., 0·7 mm.: height, 1·2 mm. (Hedley.)

Type in the Australian Museum, Sydney.

Hab.—Lyall Bay, near Wellington, type (A. Hamilton); Snares, in 50 fathoms (Captain Bollons); Banks Peninsula (Iredale). Also Tasmania.

Genus 2. Schismope, Jeffreys, 1856.

Schismope, Jeffreys, A.M.N.H., xvii, 1856, 321. Type: *S. cingulata*, Costa. *Woodwardia*, Crosse and Fischer, J. de Conch., 1861, 160. *Scissurella*, d'Orb. (in part): A. Adams, A.M.N.H., 1862, 346. *Anatomus*, H. and A. Adams, G.R.M., i, 439 (in part). *Schismope*, Fischer, Man. de Conch., 846; Man. Conch. (1), xii, 49, 60.

Anal fissure closed, forming a foramen in the outer wall of aperture; slit fasciole shorter, not over 1½ whorls in length.

Schismope is a *Scissurella* in which the anal slit becomes closed in the adult, and transformed into an oblong perforation like one of the holes of a *Haliotis*.

From Tertiary to Recent.

Key to Species.

a. Shell turbinate.
  b. With distinct spiral keels, radiating riblets fine or obsolete *Atkinsoni.*
  bb. One strong keel, base with strong radiate folds .. .. *Beddomei.*
aa. Shell depressed turbinate, nearly auriform, sculpture microscopic .. .. *brevis.*

1. Schismope Atkinsoni, Tenison-Woods, 1877. Plate 6, fig. 12.

Scissurella Atkinsoni, T.-Woods, P.R.S. Tas., 1876 (1877), 149. *Schismope Atkinsoni*, T.-Woods, P.R.S. Tas., 1877 (1878), 43; Man. Conch. (1), xii, 66; Pritchard and Gatliff, P.R.S. Vic. (n.s.), xv, 181. *S. carinata*, Watson, Caall. Rep., xv, 1886, 119, pl. 8, f. 6; Man. Conch. (1), xii, 65, pl. 65, f. 17–19. *S. Atkinsoni*, T.-Woods: Suter, T.N.Z.I., xxxix, 268.

Shell small, tumid, but depressed, umbilicated, strongly keeled. *Sculpture:* There are above and below sharp, distant, curved radiating riblets, interspaces microscopically striate; the spiral sculpture is formed by a strong, rounded, double keel, formed by the two edges of the canal-scar; this canal is sunken, and strongly scored; above the canal a few microscopic spiral threads; below there are on the base 3 strong threads, of which the highest is the strongest; a still weaker thread encircles the umbilicus. *Colour* hyaline, dead shells white. *Spire* slightly exserted, whorls flat above, rising roundly from the suture. *Apex* very small, tabulated. *Whorls* 4, rapidly increasing, strongly keeled by the canal-ridge, angulated by the highest thread; base very tumid. *Suture* rectangular. *Aperture* oval, very oblique. *Outer lip* runs in straight lines and angles, slightly curved on the base. *Inner lip* thin and short. *Columella* concave, often slightly reflexed. *Umbilicus* large, shallow, defined by a keel. *Anal perforation* long and narrow, rounded behind, drawn out into a long fine point in front, without a projecting lip on the inner side.

Diameter, 2·5 mm.; height, 2·25 mm. (type). Diameter, 1·5 mm.; height, 1·25 mm. ("Challenger" specimen). Diameter, 2·6 mm.; height, 2 mm. (Bounty Island specimen).

Type in the Tasmanian Museum, Hobart.

Hab.—Whangaroa Harbour; Snares and Bounty Islands, in 50 fathoms (Captain Bollons). Australia and Tasmania. The type is from Blackman's Bay, Tasmania.

2. Schismope Beddomei, Petterd, 1884. Plate 6, fig. 13.

Schismope Beddomei, Petterd, Journ. of Conch., iv, 1884, 139; Man. Conch. (1), xii, 67; Tate and May, P.L.S. N.S.W., 1901, 407, pl. 24, f. 24; Pritchard and Gatliff, P.R.S. Vic. (n.s.), xv, 181; Hedley, Rec. A.M., v, 1904, 89.

Shell small, thin, turbinately depressed, umbilicate. The spiral *sculpture* is formed by a strong keel of the raised edges of the canal-scar; above and below this keel the last whorl is distinctly concave and smooth; there are a few short radiate riblets spreading from the suture on the upper side; base with about 12 distant, sharp and strong, oblique riblets. *Colour* white, dull. *Spire* low, tabulated. Whorls $3\frac{1}{2}$, very rapidly increasing, flattened at the apex. *Aperture* ovate, oblique, of moderate size. *Outer lip* sharp, broadly convex. *Inner lip* spread a short distance over the body, and forming a sharp angle with the outer lip. *Columella* concave truncated below, slightly

callous. *Umbilicus* rather large and deep. *Anal perforation* with raised margins, moderately long, rounded behind, pointed in front, with a very distinct callosity on the inner side.

Diameter, 0·75 mm. ; height, 1 mm. (type). Diameter, 1·5 mm. ; height, 1·25 mm. (Snares specimen).

Type in the Tasmanian Museum, Hobart.

Hab.—Foveaux Strait (A. Hamilton) ; Snares and Bounty Islands, in 50 fathoms (Captain Bollons). Australia and Tasmania. The type is from the north coast of Tasmania.

Remark.—The New Zealand specimens attain a larger size, and are more depressed, but otherwise there is no difference.

3. **Schismope brevis,** Hedley, 1904. Plate 6, fig. 14.

Schismope brevis. Hedley. Rec. A.M., v. 1904. 90, f. 16 in text ; Iredale, T.N.Z.I., xl, 381.

Shell depressed, turbinate, openly perforate to imperforate, solid. *Sculpture:* Distant longitudinal lamellate ribs cross the whorl from the suture to the umbilicus ; their interstices contain raised spiral threads, which grow coarser on approaching the umbilicus. *Colour* white. *Protoconch* of a whorl and a half, concluding with a prominent varix. *Whorls* 3, tabulate above, rounded below, the last rapidly descending. *Aperture* roundly ovate. *Outer lip* sharp, convex. *Inner lip* spreading as a distinct callosity over the body, and sometimes sealing the umbilicus partly or wholly up. *Columella* concave. *Umbilicus* narrow, deep, bordered with a raised ridge, or closed up. The *foramen* is large, distant from the margin, to which a furrow joins it. The fasciole extremity short, terminating half a whorl behind the aperture, bordered by keels and traversed by lamellæ, which correspond to the longitudinal ribs.

Diameter—Maj., 1·14 mm. ; min., 0·9 mm. : height, 0·94 mm. (type).

Type in the Australian Museum, Sydney.

Hab.—Lyall Bay, near Wellington, type (A. Hamilton) ; Snares, in 50 fathoms (Captain Bollons) ; Lyttelton Harbour (Iredale). Living on seaweeds.

Remarks.—All the specimens from the Snares I have seen have the umbilicus more or less closed up. Live shells from Lyttelton Harbour are cream-coloured, young ones very commonly brownish (Iredale).

Subsp. **levigata,** Iredale, 1908.

Schismope brevis, Hedley, subsp. *levigata,* Iredale, T.N.Z.I., xl, 1907 (1908), 381.

This subspecies differs from the type in the degree of sculpture. At first sight it would appear a very different shell, but when closely examined the sculpture is seen to be the same : the longitudinal ribs have greatly deteriorated in strength, whilst the spirals have gained ;

the last whorl descends much more rapidly than in typical *brevis*, whilst the earlier whorls are smaller. This combination gives an entirely different appearance to the shell, which is further strengthened by the fact that the fasciole is very little longer than the foramen. Operculum thin, horny, multispiral. Colour cream; dead shells pure-white. Measurement of a large specimen the same as the type of *S. brevis*, Hedley. (Iredale.)

Type in the Canterbury Museum, Christchurch.

Hab.—Sandfly Bay, Otago Peninsula (type); Lyall Bay.

I have not seen this shell.

Fam. **HALIOTIDÆ**, Fleming.

Animal with a fleshy foot, a fleshy epipodial ridge fringed with cirri, a frontal veil connecting the short eye-stalks; spire of the visceral mass much reduced; the mantle-slit along the row of holes, branchial cavity containing a gill on each side of the slit, the right being the smaller; no operculum.

Shell nacrous, spiral, the spire small, body-whorl very large and depressed, having a row of round or oval holes along the left side, aperture very large, occupying nearly all the lower face, columella (properly speaking) absent, the spire being open in the middle, seen from below; but the columellar margin is produced into a flattened spiral plate. Muscle-impression horseshoe-shaped, the left branch narrow, inconspicuous, inside the columellar plate, the right branch very large, rounded, situated in the middle of the aperture.

A few fossil forms not differing materially from the Recent ones have been discovered in the Pliocene and Miocene, and one in the Upper Cretaceous of Germany. The centre of distribution of Recent species is in the Australian and adjacent seas. Only one species is found on the east coast of North America.

All of these molluscs are rock-lovers. The shells are much used as ornaments, for the manufacture of pearl buttons, buckles, and inlaying. Fine green pearls may be sometimes found under the mantle. The animal is used as bait for catching crayfish, and is sometimes used for food.

Genus 1. Haliotis, Linnæus, 1758.

Haliotis, Linn., Syst. Nat., ed. x, 1758, 779. Type: *H. tuberculata*, L.
Padollus, Montfort, Conch. Syst., ii, 114. *Sulculus*, Ad., G.R.M., i, 443.

Animal with a short, broad muzzle; tentacles subulate, with the eyes on stout cylindrical peduncles at their outer bases. Foot moderate, not grooved, and produced posteriorly. Radula with a subpentagonal central tooth, constricted in the middle; the 5 laterals are large, unequal in shape; uncini numerous.

Shell oval or oblong, nacreous; spire small, much depressed; suture well marked; aperture with continuous borders; columella border broad, compressed, and arched; outer margin very oblique;

muscular impression frequently rugose ; typically perforated near the periphery, the holes being numerous and in series.

There are about eighty species known, inhabiting tropical and temperate seas : west coast of Europe, Mediterranean, east coast of Africa, Cape of Good Hope, Indian and Pacific Oceans, China, Japan, California, Australia, Tasmania, and New Zealand.

Tertiary to Recent.

Vernacular Name.—Ormer, or sea-ear.

Anatomy.—H. J. Fleure, "Zur Anatomie und Phylogenie von Haliotis," Jena. Zeitschr., xxxix, 1904, 245–322, pl. 9–14.

KEY TO SPECIES.

a. Peristome continuous .. .. *iris.*
aa. Peristome not continuous.
b. Right margin straightened.
c. Surface strongly corrugated by radiating folds .. *australis.*
cc. Surface pustulated and waved .. .. .. *varia.*
bb. Both margins convex .. .. *virginea.*

1. **Haliotis australis,** Gmelin, 1790. Plate 8, fig. 1.

Haliotis australis, Gmelin, Syst. Nat., ed. xiii, 3689. *H. rugoso-plicata*, Chemnitz, Conch. Cab., x, 311, pl. 166, f. 1604 (not binomial); Reeve, Conch. Icon., f. 7 ; Sowerby, Thes. Conch., v, 21, f. 9, 10, 53 ; Man. Conch. (1), xii, 110, pl. 20, f. 12, 13. *H. australis*, Gmel. : Hedley, Colon. Museum Bull. No. 1, 1906, 49 ; Suter, T.N.Z.I., xxxviii, 323. *H. plicata*, Karsten, Mus. Leskeanum, 1789. *H. cruenta*, Reeve, Conch. Icon., f. 56 : Man. Conch. (1), xii, 99, pl. 4, f. 17, 18 ; pl. 49, f. 24–26. *H. costata*, Swainson, Appendix Bligh Cat., 3. *H. ruber*, Leach, Zool. Misc., i, 54, pl. 23, *teste* Dillwyn.

Shell oval, quite convex, distance of apex from margin one-eighth to one-ninth the length of the shell. *Sculpture :* The surface has almost obsolete spiral cords, and regular, close, radiating folds ; between the row of holes and the columellar margin there are no radiating folds, but several (generally 3) strong spiral ribs. *Colour* light yellowish-brown, red on the spire, or light green flamed with red. *Spire* a little elevated. *Whorls* 3. The *right margin* a little straighter than the left ; *back* convex, not carinated at the row of holes. *Inside* corrugated like the exterior, silvery, with blue, green, and red reflections, the latter predominating. *Columellar plate* narrow. *Perforations* circular, their edges elevated, 6 to 8 in number.

Length, 94 mm. ; breadth, 71 mm. ; convexity, 30 mm. Length, 82 mm. ; breadth, 56 mm. ; convexity, 22 mm.

Type (?).

Hab.—Throughout New Zealand ; Chatham, Snares, and Auckland Islands.

Remarks.—The corrugated exterior is quite constant and characteristic. Young specimens are more ribbed spirally, and often have radiating stripes of red on a delicate green ground.

Maori.—Karariwha (*fide* Captain Bollons).

Fossil in the Pliocene.

2. **Haliotis iris**, Martyn, 1784. Plate 8, fig. 2.

Haliotis iris, Martyn, Univ. Conch., ii, f. 61; Reeve, Conch. Icon., f. 37; Sowerby, Thes. Conch., v, 20, pl. 3, f. 24, 25; Man. Conch. (1), xii, 110, pl. 13, f. 65, 66.

Shell oval, the two sides equally curved, convex. *Sculpture* consists of rows of low radially arranged nodules; young shells are spirally lirate like *H. virginea*, with a few oblique rows of nodules; surface pitted; concentric growth-lines very distinct. *Colour* pale brown or olive-green. *Spire* short, with 2 whorls only. *Protoconch* smooth, consisting of half of a whorl. *Back* of shell convex, angled at the row of perforations. *Lip* continuous, produced beyond the body-whorl. *Inside* it is brilliantly pearly, prussian-blue and green predominating, but with reflections also of purple, orange, and a little red; central muscle-scar roughened, copper-coloured. *Columellar plate* broad, passing into the expanded continuation of the outer lip above, not truncate below; its face is flattened, and slopes inward; cavity of spire small. *Perforations* round to oval, 5 to 7 open.

Length, 95 mm.; breadth, 70 mm.; convexity, 25 mm. Length, 141 mm.; breadth, 102 mm.; convexity, 36 mm.

Animal and *Dentition*.—Hutton, T.N.Z.I., xv, 127, pl. 15, f. H.

Hab.—Rocky shores of the North and South Islands; Chatham, Snares, and Auckland Islands. Below low-water mark, in some localities very abundant. Brought to England by Captain Cook.

Remarks.—This shell has been much used by the Maoris for ornamenting their carvings and for fishing-hooks; the animal was used as food.

Maori.—Paua.

Vernacular Name.—Mutton-fish.

Fossil in the Miocene.

3. **Haliotis varia**, Linnæus, 1758. Plate 7, fig. 24.

Haliotis varia, Linn., Syst. Nat., ed. x, 780; Reeve, Conch. Icon., f. 4; Sowerby, Thes. Conch., v, 28, f. 5, 6, 7, 11, 12, 61; Man. Conch. (1), xii, 95, pl. 17, f. 91, 93, 99, 100; pl. 23, f. 53–55; Suter, T.N.Z.I., xxxix, 268. *H. viridis*, Reeve, Conch. Icon., f. 40. *H. semistriata*, Reeve, Conch. Icon., f. 51 *a*, *b*, *c*.

Shell oval or oblong-oval, convex, distance from apex to margin about one-eighth the entire length of shell. *Sculpture:* Numerous very unequal spiral cords, crossed by low radiating folds, forming tubercles on the cords; the surface sculpture is excessively variable, but in the typical form consists of "swollen nodules ranging across the shell in oblique waves." *Colour* usually consists of broad white or greenish rays upon a dark-chocolate, olive-brown, or green ground. The *spire* is rather large. *Protoconch* flattened, consisting of 1 whorl, with a peripheral row of nodules, a few spiral striæ above. *Whorls*

$2\frac{1}{2}$, the last convex. *Aperture* large, the right margin straighter than the left, but still convex. *Inside* silvery, generally with very little iridescent colour, and having slight excavations or pits at the positions of the principal tubercles of the outer surface. *Columellar plate* rather broad and heavy, flattened, and in adult shells sloping inward, not truncated at the base; cavity of spire visible from below. Open *perforations* 5, round to oval, situated on moderate tubercles.

Length, 47 mm.; breadth, 31 mm.; convexity, 12 mm. Length, 40 mm.; breadth, 28 mm.; convexity, 11 mm. (New Zealand specimen).

Type (?).

Hab.—South of Whangarei. This is a widely dispersed form—Australia and Philippines to China, Mozambique, Red Sea, Island of Bourbon, Mauritius, Ceylon, Nicobar Islands, Malay Archipelago, according to Man. Conch.

Remark.—In New Zealand specimens I found the number of open perforations to vary from 5 to 7.

4. **Haliotis virginea,** Gmelin, 1790. Plate 7, fig. 23.

Haliotis virginea, Gmelin, Syst. Nat., ed. xiii, 3690; Chemnitz, Conch. Cab., x, 314, pl. 166, f. 1607, 1608 (not binomial); Sowerby, Thes. Conch., v., 20. *H. gibba*, Philippi; Reeve, Conch. Icon., f. 42; Smith, Ereb. & Ter., Moll., 4, pl. 1, f. 16; Hutton, M.N.Z.M., 104, not of Philippi. *H. virginea*, Gmel.; Hedley, Colon. Museum Bull., i, 1906, 49; Suter, T.N.Z.I., xxxviii, 323.

Shell oblong-oval, very convex, spire almost terminal, spirally lirate. *Sculpture:* About 44 spiral lirae between spire and perforations, sometimes unequal, slightly beaded by growth-lines; there are some small folds radiating from the spire over the middle part of the back, but these are obsolete on some examples. *Colour* dark brown, marked with more or less perfect V-shaped green streaks, green sometimes predominating. *Spire* almost terminal, very small. *Whorls* $2\frac{1}{2}$. *Right* and *left sides* equally curved, widest at about the middle; *back* very convex, not carinated at the row of holes, but having a very shallow excavation ust below it. *Inside* spirally striate, somewhat corrugated obliquely, very brilliantly iridescent, the prevailing colours green and red. *Columellar plate* flattened or a little concave, decidedly sloping inward, subtruncate at base, concealing the cavity of spire above. *Perforations* 6 or 7, separated by spaces exceeding the length of the holes.

Length, 54 mm.; breadth, 35 mm.; convexity, 13 mm.

Type (?).

Hab.—North and South Islands; Stewart Island; Chatham Islands; Kermadec Islands. More common in the south. Brought to England by Captain Cook.

Subsp. **Huttoni**, Filhol, 1880. Plate 8, fig. 3.

Haliotis Huttoni, Filh., "Comptes Rendus," xci, 1094; Filhol, Miss. I.C., 1885, 527. *H. gibba*, Phil., var. *Huttoni*, Filh.: Hutton, P.L.S. N.S.W., ix, 370.

The spiral liræ are stronger and slightly waved, the apex is less anterior, the shell more convex. The sculpture is much coarser, the spiral liræ stouter and less numerous, strong and much finer cords usually alternating. The colour is mostly light brown or greenish; there are no V-shaped streaks. As a rule, the shell is not so elongate as the species. The prevailing colour of the interior is red.

Length, 50 mm.; breadth, 35 mm.; convexity, 15 mm. Length, 52 mm.; breadth, 38 mm.; convexity, 18 mm. Length, 62 mm.; breadth, 43 mm.; convexity, 21 mm.

Type in the Mus. Hist. Nat., Paris.

Hab.—Campbell Island.

Remarks.—Captain Bollons told me that this mollusc is eaten by the seals, apparently without crushing the shell with the teeth, and when the animal has been digested the empty shells are disgorged. The shells lying about on the beach are pearly outside, having lost the epidermis through the action of the acid gastric juice in the stomach of the seals.

Fam. **FISSURELLIDÆ**, Risso.

Animal bilaterally symmetrical externally, the anal orifice on the median line either anterior, central, or posterior. Gills paired, one on each side of the back, their free ends extending to the neck; muzzle stout; eyes on peduncles of variable length at the outer bases of the tentacles; mantle continuous or slit anteriorly; foot fleshy, bearing generally a row of epipodial papillæ. Adductor muscle horseshoe-shaped, open anteriorly. Radula with central, lateral, and uncinal teeth, the laterals usually 5 in number, narrow except the outer one, which is very large, with a strongly recurved and denticulated cusp; uncini numerous.

Shell conical, limpet-shaped, non-spiral (but with a spiral nucleus), having a perforation, anterior slit, notch, or emargination for the passage of the anus; not nacrous; having a horseshoe-shaped impression of the adductor muscle; bilaterally symmetrical.

Carboniferous to Recent.

Subfam. 1. FISSURELLINÆ. Pilsbry.

Central tooth of radula narrow. Shell wholly external, capable of containing the entire animal. Apex of shell wholly removed by the anal perforation, which is bounded inside by a callus with entire margins, not truncated or excavated posteriorly.

This subfamily does not antedate the Pliocene.

Genus 1. Fissurella, Bruguière, 1791.

Fissurella, Brug., Encycl. Méth.; Lamarck, A.s.V., &c. Type: *F. picta*. Gmel.

The anatomy of the typical species is not thoroughly known. It appears that the mantle-edge is thick, crenulated above and below, granulate or papillose on its rather broad surface; the anal pore is surrounded by slender processes or papillæ, and the row of epipodial papillæ is continuous.

Summit of the shell near the middle; basal margins level, not elevated at the ends; form of shell elevated conoidal, with an apical perforation; surface nodulous or decussate.

Sect. 1. Cremides, H. and A. Adams, 1858.

Cremides, Ad., G.R.M., i, 446. First species: *F. alabastrites*, Reeve.

Fissurella with the orifice near the middle, the outer surface radiately ribbed or striated, the inside without a dark marginal border, and more or less crenulated on the edge.

They inhabit tropical and subtropical coasts of America, with a few species from South Africa and the Mediterranean.

1. **Fissurella Huttoni**, Suter, 1906. Plate 8, fig. 4.

Fissurella squamosa, Hutton, C.M.M., 1873, 42; M.N.Z.M., 105; P.L.S. N.S.W., ix, 370, not of Deshayes. *Glyphis squamosa*, Hutt., Man. Conch. (1), xii, 216. *Fissurella Huttoni*, Suter, T.N.Z.I., xxxviii, 322.

Shell elongately oval, narrowed in front, conoidal, summit a little in front of the middle. *Sculpture* consisting of numerous more or less squamose ribs, alternately larger and smaller, 4 anterior and 4 posterior ribs more prominent than the others; they are crossed by fine concentric growth-striæ, much more distinct near the base. *Colour* light brown, most of the ribs lighter, cinereous. *Dorsal orifice* oblong, becoming smaller as it penetrates; its length measured outside is 2 mm. *Inside* white, porcellanous, muscle-scar distinctly impressed, perforation callus strong, white, with a minute posterior incision, encircled by a light-brown line. *Margin* irregularly crenulated.

Length, 23 mm.; breadth, 15 mm; height, 7 mm.

The *animal* is unknown.

Type in the Dominion Museum, Wellington.

Hab.—Foveaux Strait (*fide* Hutton).

Remark.—As far as I am aware, the type specimen is the only one in any of our collections.

Subfam. 2. Emarginulinæ, Pilsbry.

Apex of shell generally not removed, the anal tube occupying an anterior slit, notch, or sinuation, or if apex be removed by a perforation the hole is provided internally with a shelf or septum projecting

forward and downward from behind it, or if bounded by a callus the latter is truncated or excavated posteriorly. Central tooth of radula broad.

KEY TO GENERA.

1. Apex in front of the middle, absorbed by the hole, the latter bounded inside by a distinct oval hole-callus, truncated behind .. .. FISSURIDEA.
2. Apex central or post-median, persistent. Anal fissure a closed hole at summit .. .. PUNCTURELLA.
3. No internal hole-callus or septum, apex not absorbed.
   - A. Apex subterminal; shell minute, subauriform, a short slit on upper part of outer lip .. .. .. INCISURA.
   - B. A slit-fasciole or band in front, distinctly differentiated from the other radiating riblets, extending upward from the open anterior slit .. .. .. EMARGINULA.
   - C. No distinctly differentiated slit-fasciole or band; ends of muscle-scar distinctly hooked inward; shell having radiating ribs and crenulated edge, slit short or none. .. .. SUBEMARGINULA.
   - D. No anterior slit or slit-fasciole; muscle-scar near the edge of the shell, its front ends not hooked inward; shell depressed, oblong, truncated or sinuous in front; no radiating sculpture; edge smooth .. SCUTUS.

Genus 1. INCISURA, Hedley, 1904.

Incisura, Hedley, Rec. A.M., v, 1904, 91. Type: *Scissurella lytteltonensis*, E. A. Smith.

Shell minute, subauriform, smooth. Apex submarginal, few whorls, the last very large; a short slit on the outer lip above the periphery, bounded by a callus on the inner side. There is no operculum. Teeth of radula similar to those of *Emarginula*.

Hedley considers it as a member of the *Fissurellidæ* in which development has been arrested; the usual subsequent metamorphoses have not been enacted and the larval characters have persisted in adult life.

The absence of an operculum removes it from the genus *Scissurella*, and the characters of the radula, which I have examined, show that it is nearly allied to *Emarginula*. The radula is asymmetrical.

1. Incisura lytteltonensis, E. A. Smith, 1894. Plate 6, fig. 15.

Scissurella lytteltonensis, E. A. Smith, P. Mal. S., i, 57, pl. 7, f. 1, 2. *Incisura lytteltonensis*, E. A. Smith: Hedley, Rec. A.M., v, 92, f. 18 in text; Iredale, T.N.Z.I., xl, 381.

Shell minute, subauriform. There is no *sculpture*, except fine growth-lines. *Colour* white, horny, or sometimes roseate. *Protoconch* not prominent, microscopically delicately radiately ribbed. *Whorls* 2,

very rapidly increasing, the last large. *Suture* deep. *Aperture* large, oval, the margins united by a strong callus. *Outer lip* sharp, simple. *Inner lip* broadly reflexed. The *slit* is situate above the periphery, short, not ridged or keeled, and strengthened by a fairly strong callus on the inner side.

Diameter, maj., 1·3 mm.; height, 1 mm. (type). Diameter, maj., 1·8 mm.; height, 1·3 mm. (Snares specimen).

Type in the British Museum.

Hab.—Lyttelton Harbour, on seaweeds, type (H. S.); Lyall Bay, near Wellington; Snares, in 50 fathoms (Captain Bollons).

Remarks.—There is no operculum, and the radula approaches that of *Emarginula*.

Genus 2. Emarginula, Lamarck, 1801.

Emarginula, Lamarck, Syst. A.s.V., 1801, 69. Type: *Patella fissura*, L.
Emarginula, Lamarck: Fischer, Man. de Conch., 858; Man. Conch. (1), xii, 202, 248. *Semperia*, Crosse, J. de Conch., 1867, 74.

Animal having the snout large, tentacles long, eyes on distinct peduncles; mantle forming a tubular process extending beyond the anterior anal slit in the shell; having epipodial papillæ, and the foot oval. Central tooth of radula large, quadrangular; the inner 4 lateral teeth long and narrow; the fifth large, bicuspid, its upper part bent horizontally; uncini numerous.

Shell oval, obliquely conical, the recurved apex directed backward; front slope with a deep incision in the margin. A distinct anal fasciole extends upward from the fissure, sculptured differently from the other ribs of the surface; surface latticed; no septum or deck inside.

From the Carboniferous to Recent; many species are known from the Tertiary. The Recent species of *Emarginula* s.s. number about sixty, and are recorded from the Mediterranean, the Atlantic, the Gulf of Mexico, and the Indo-Pacific. They live from the upper laminarian to the coralline zone.

Vernacular Name.—Slit-limpet.

1. Emarginula striatula, Quoy and Gaimard, 1834. Plate 8, fig. 5.

Emarginula striatula, Q. & G., Voy. Astrol., Zool., iii, 1834, 332, pl. 68, f. 21, 22; Man. Conch. (1), xii, 259, pl. 64, f. 2.

Shell ovate-conic, fragile and thin, apex oblique, recurved. *Sculpture:* Radiating ribs close together, granulate; spiral ridges of growth prominent, irregular, producing with the ribs subcancellation. *Colour* greyish or greenish-white. *Margin* crenulated. *Slit* deeply excavated. *Interior* white to greenish.

Length, 10 mm.; breadth, 7 mm.; height, 7 mm. (type). Length, 24 mm.; breadth, 19 mm.; height, 11 mm. (Chatham Islands). Length, 22 mm.; breadth, 15 mm.; height, 13 mm. (Chatham Islands).

The *animal* is unknown.

Type in the Mus. Hist. Nat., Paris.

Hab.—In fairly deep water. New Brighton, in roots of *Macrocystis;* Foveaux Strait, in 15 fathoms; Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons); Snares and Bounty Islands, in 50 fathoms (Captain Bollons); Hauraki Gulf, in 25 fathoms; Chatham Islands; Bay of Islands.

Remarks.—This species is variable in size and shape; the largest specimens I have seen are from the Chatham Islands, and they are fairly solid. The examples from 50 fathoms are small and very thin.

Fossil in the Miocene and Pliocene.

Genus 3. Subemarginula, Blainville, 1825.

Subemarginula, Blainville, Man. de Malacologie, 1825, 501. Type: *Emarginula emarginata*, Bl. *Subemarginula*, Blainville, Man. Conch. (1), xii, 202, 273. *Hemitoma*, Swainson, Malac., 356. *Siphonella*, Issel, Mal. Mar. Rosso, 1869, 232.

Mantle entire, not slit or tubular in front.

Shell rounded-oval, conical, apex near the middle, curved backward; surface radiately ribbed; anal notch generally short, continued upward as a groove inside, occupying the end of a slightly prominent anterior rib, which is not sculptured differently from the other ribs. The great muscle-scar exhibits a peculiarity diagnostic of this genus: its anterior terminations are recurved and produced inward toward the cavity of the apex.

The genus is recorded from the Antilles, the Indo-Pacific, and Australasia.

Key to Species.

A. Shell with an internal anterior groove, area within the muscle-scar in the shape of a mushroom .. .. .. *rugosa.*
B. Shell without an internal anterior groove, oblong, depressed, apex posterior.
  a. Shell without an anterior emargination, sides subparallel *parmophoidea.*
  b. Shell with a distinct emargination in front, sides narrowed in front .. .. *intermedia.*

Sect. 1. Clypidina, Gray, 1847.

Clypidina, Gray, Syst. Dist. Moll. Brit. Mus., 164; A. Adams, P.Z.S., 1851, 87.

Internal groove distinct, ending in a short anterior notch; area within the muscle-scar decorated with a dark figure in the form of a mushroom.

1. Subemarginula rugosa, Quoy and Gaimard, 1834. Plate 38, fig. 1.

Emarginula rugosa, Q. & G., Voy. Astrol., Zool., iii, 331, pl. 68, f. 17, 18. *Subemarginula rugosa*, Q. & G., Man. Conch. (1), xii, 278, pl. 64, f. 39–41; pl. 29, f. 10, 11. *Clypidina candida*, A. Adams, P.Z.S., 1851, 88. *C. annullata*, A. Ad., *t.c.*, 88. *C. scabricula*, A. Ad., *t.c.*, 88. *Emarginula fungina*, Gould, P. Bost. S.N.H., ii, 1846, 154; Exped. Atlas, f. 491. *E. conoidea*, Reeve, Conch. Syst., ii, 23, pl. 140, f. 7. *Clypidina acuminata*, A. Ad., *t.c.*, 88, No. 10.

Shell oval, conical, apex subcentral. *Sculpture* consisting of 13–17 primary ribs, not split or double, which are narrow, raised, continuing to the apex, each interval occupied by 3 small riblets; cancellated by close raised concentric threads, which form prickly scales where they cross the radiating ribs. *Interior* greenish or white, the area within the muscle-scar dark or outlined with dark green, usually distinctly mushroom-shaped. *Anal groove* deep, notch short.

Length, 17·5 mm.; breadth, 13 mm.; height, 8·5 mm. Length, 10·5 mm.; breadth, 8 mm.; height, 4·5 mm. (specimen from Foveaux Strait).

Type in the Mus. Hist. Nat., Paris.

Hab.—Nelson; the Brothers Islands, Cook Strait; Foveaux Strait, in 15 fathoms; Chatham Islands. Australia, Tasmania, and Samoa.

Remarks.—A rather rare shell in New Zealand seas, mostly found with *E. striatula*.

Sect. 2. Tugalia, Gray, 1843.

Tugalia, Gray, Syst. Dist. Moll. Brit. Mus., 163. Type: *Tugali elegans*, Gray. *Tugali*, Gray.

Shell oblong, depressed, apex posterior, front margin without a notch, either rounded or sinuous; no internal anal groove; no enlarged rib in front.

2. Subemarginula parmophoidea, Quoy and Gaimard, 1834. Plate 39, fig. 1.

Emarginula parmophoidea, Q. & G., Voy. Astrol., Zool., iii, 325, pl. 68, f. 15, 16. *Subemarginula parmophoidea*, Q. & G., Man. Conch. (1), xii, 285 (pl. 43, f. 78–80 represent *S. intermedia*).

Shell oval, rounded at the ends, apex near the margin, sides subparallel. *Sculpture* consisting of close radiating and concentric ribbings of about equal size, granulated and cancellated. *Apex* obtuse. No emargination in front. *Colour* white or yellowish-white. *Interior* white; margin denticulated.

Length, 19 mm.; breadth, 11 mm.; height, 6 mm. (type).

Type in the Mus. Hist. Nat., Paris.

Hab.—Cape Maria van Diemen; Hauraki Gulf; Chatham Islands. Australia.

Remark.—It is a much rarer shell than the nearly allied *S. intermedia*, but less local.

Fossil in the Pliocene.

3. **Subemarginula intermedia**, Reeve, 1842. Plate 8, fig. 6.

Parmophorus intermedius, Reeve, P.Z.S., 1842, 50; Conch. Syst., ii, pl. 139, f. 5, 6. *Tugalia intermedia*, Rve.: A. Ad., P.Z.S., 1851, 88. *Tugali elegans*, Gray, Dieff. N.Z., ii, 240. *Tugalia cinerea*, Gould: Sowerby, Thes. Conch., iii, 221, pl. 249, f. 15–17; Reeve, Conch. Icon., xvii, f. 5, not of Gould. *T. ossea*, Gould: Sowerby, *l.c.*, f. 18; Angas, P.Z.S., 1867, 219, not of Gould. *T. australis*, T.-Woods, P.R.S. Tas., 1877, 21. *T. tasmanica*, T.-Woods, *t.c.*, 156. *Subemarginula intermedia*, Reeve, Man. Conch. (1), xii, 285, pl. 43, f. 83, 84.

Shell oblong-ovate, broadly rounded behind, narrower toward the front, and having a shallow emargination in the front margin. *Surface* finely latticed all over by numerous close fine radiating riblets crossed by close elevated concentric striæ; the posterior half near the margin sometimes with beautiful concentric zigzag bands. *Colour* light buff to blackish-green. *Apex* at the posterior fifth. *Interior* white, sometimes light-greenish. *Margin* obtuse, finely crenulated.

Length, 21 mm.; breadth, 12 mm.; height, 6 mm. Length, 43 mm.; breadth, 26 mm.; height, 11·5 mm. (Auckland specimen).

Anatomy. — M. Tobler, Jena. Zeitschr., xxxvi, 1901, 229–74, pl. 13–15.

Dentition.—Q.J.M.S. (n.s.), viii, 1868, pl. 12, f. 57.

Type in the British Museum.

Hab.—Hauraki Gulf (H. S.); Great Barrier Island (Dieff.); Banks Peninsula (Iredale). Australia. The type is from Port Jackson.

Fossil in the Pliocene.

Genus 4. Scutus, Montfort, 1810.

Scutus, Montfort, Conch. Syst., ii, 1810, 58, 59. Type: *Scutus antipodes*, Montfort. *Parmophorus*, Blainville, Bull. Sci. Soc. Phil., 1817, 25. *Scutum* of some authors.

Snout of animal proboscidiform; mantle ample, covering nearly the whole of the shell, with a simple margin, fissured in front. Tentacles thick, eyes at their outer bases. A row of short cirri on each side of neck and foot. Gills 2, symmetrical, outside the shell, under the mantle; a round white renal opening at their apices. The whole body dark blue-black; mantle paler below; sole of the foot white. Radula as in *Emarginula*; central tooth large, outer lateral tricuspid; uncini not denticulate.

Shell oblong, depressed, apex directed backward; no anal groove or slit, but the front margin more or less truncated and sinuous; surface without radiating sculpture; anterior ends of the muscle-scar converging, but not hooked inward toward the apex.

Distributed over the Indo-Pacific.

Fossil in the Tertiary (*Proscutum*, Fischer).

The animals are apathetic, and avoid the light; they are found under boulders between tide-marks.

E. A. Smith has thoroughly revised the genus in an excellent paper in the Quart. Journ. Conch., ii, 1879, 250.

1. Scutus ambiguus, Chemnitz, 1795. Plate 8, fig. 7.

Patella ambigua, Chemn., Conch. Cab., xi, 178, 181, f. 1918. *Scutus ambiguus*, Chemn.: Smith, Quart. Journ. Conch., ii, 1879, 258, f. 1–3; Man. Conch. (1), xii, 289, pl. 40, f. 9–11. *Scutus antipodes*, Montfort, Conch. Syst., ii, 1810, 58, 59. *Parmophorus breviculus*, Blainville, Bull. Sci. Soc. Phil., 1817, 28. *Scutus unguis*, L.: A. Adams, P.Z.S., 1851, 221; Hutton, M.N.Z.M., 106, not of Linnæus. *Parmophorus australis*, Lamarck: Hutton, C.M.M., 43, not of Lam.

Shell oblong, length about twice the breadth, depressed, sides parallel, posterior end rounded, anterior end squarely truncated, sinuated. *Surface* concentrically striated. *Colour* brown, in adult large specimens often white, eroded. *Apex* low, at about the posterior fourth. *Inside* white, sometimes bluish or greyish inside the muscle-scar; the latter is distinct, rugose. *Margin* callous, smooth, rounded.

Length, 54 mm.; breadth, 28 mm. Length, 63 mm.; breadth, 35 mm. (my largest specimen).

Animal.—Hutton, T.N.Z.I., xiii, 203.

Dentition.—Hutton, T.N.Z.I., xv, 127, pl. 15, f. I.

Type (?).

Hab.—North and South Islands of New Zealand, but more common in the North.

Maori.—Rori (*fide* Captain Bollons).

Genus 5. Puncturella, Lowe, 1827.

Puncturella, Lowe, Zool. Journ., iii, 77, 78. Type: *Patella noachina*, L. *Cemoria*, Leach (MS., 1819), Moll. Gr. Brit. (Gray's edit.), 1852, 213; Ad., G.R.M., i, 450. *Sipho*, Brown, Ill. Conch. Gr. Brit., 1827, pl. 36, f. 14–16; not of Klein, Fabricius, Moerch. *Puncturella*, Man. Conch. (1), xii, 202, 228.

Animal with a tubular process, surrounded by papillæ, passing through the perforation, being formed by the mantle; epipodial line with a series of conical tentacles; a cirrus on the dorsal part of the foot. Jaws fibrous; radula that of *Emarginula*.

Shell small, conical, having a spirally recurved apex either persistent or absorbed in the adult, the fissure either lanceolate or oval, on the front slope or at the summit of the cone; inside there is a plate extending forward, forming a conduit to the fissure or a "deck" over it. The spiral apex is inclined toward the right side, and the fissure is also a trifle to the right of a median line, when visibly excentric. The surface usually shows minute granules under a strong magnification.

This is mainly a deep-sea group, living in the northern and southern cold seas. About thirty species are known.

Fossil in the Tertiary of Italy.

Sect. 1. Puncturella, s. str.

Apex persistent; the fissure at or near the summit; the internal plate with or without side props.

1. Puncturella demissa, Hedley, 1904. Plate 6, fig. 16.

Puncturella demissa, Hedley, Rec. A.M., v, 1904, 93, f. 19 in text; *l.c.*, vi, 289, pl. 54, f. 3–5.

Shell small, thin but opaque, low-arched, summit posterior, within the margin. *Sculpture:* Fine incremental threads, scarcely undulated by obsolete radial ribs. *Colour* white. *Anterior slope* gentle, arched; posterior steep, straight. *Nucleus* persistent, set obliquely, exposing part of 2 spiral whorls. *Slit* on the summit linear-lanceolate, more than three times longer than broad. *Aperture* oblong, rather broader in front. The *septum* drawn down to a third of the length of the shell, completely screening the interior from the slit, thickened at the margin.

Length, 1·8 mm.; breadth, 1·2 mm.; height, 1 mm., type (Hedley). Length, 2·5 mm.; breadth, 1·5 mm.; height, 1·5 mm. (Hedley).

Type in the Australian Museum, Sydney.

Hab.—Foveaux Strait, type (A. Hamilton); Snares, in 50 fathoms (Captain Bollons). Australia: 22 miles east of Narrabeen, in 80 fathoms (Hedley); off Port Stephens; off Port Kembla, in 63–75 fathoms; Wreck Bay, in 20 fathoms.

Remarks.—The comparative smoothness, persistent apex, narrow fissure, and long septum sufficiently characterize this minute species. The surface is clothed with a rather caducous ochraceous epidermis, disposed in oblong grains. When stripped of the epidermis the white surface of the shell shows no trace of these grains, and would readily pass for a different species. Towards the margin some specimens have broad, shallow, radial undulations (Hedley).

Genus 6. Fissuridea, Swainson, 1840.

Fissuridea, Swains., Malacology, 1840, 356. Type: *F. pileus*, Swains. *Lucapina* (in part), Ad., G.R.M., i, 447. *Capiluna*, Gray, 1857. *Glyphis*, Carpenter, P.Z.S., 1856 (1857), 223; not of Agassiz, 1843: Man. Conch. (1), xii, 175, 202, 203.

Animal capable of being entirely contained in the shell, resembling *Fissurella* in external characters. Snout short, ending distally in an oval disc, with the mouth in the centre; tentacles subulate, with black eyes on little projections at their outer bases; epipodium consisting of a fringe of short filamentous processes alternately larger and smaller, becoming more obsolete posteriorly, where it is marked by little tubercles in place of the filaments. Mantle-edge smooth or papillose, usually rather broad. Central tooth of the radula wide.

Shell ovate, conical, the orifice in front of the middle. The apex spiral, inclined backward in the young, wholly absorbed in the adult.

Surface cancellated by radiating and concentric riblets or striæ. Internal hole-callus truncated behind or having a pit there. Basal edges of the shell in a plane or the sides slightly elevated; ends never elevated; margin crenulated.

Mediterranean, Atlantic, Indo-Pacific.

Fossil in the Tertiary.

The young *Fissuridea* has a recurved spiral apex with the fissure in front of it, exactly as in *Rimula*. The truncation and pit back of the hole-callus are homologous with the septum and pit back of the hole in *Puncturella*.

1. Fissuridea monilifera, Hutton, 1873. Plate 8, fig. 8.

Lucapina monilifera, Hutt., C.M.M., 42. *Fissurella monilifera*, Hutt., P.L.S. N.S.W., ix, 370. *Megatebennus moniliferus*, Hutt., Plioc. M., 72, pl. 8, f. 76. *Glyphis* (?) *monilifera*, Hutt., Man. Conch. (1), xii, 227.

Shell small, oval, slightly wider behind the foramen, depressed conoidal. *Sculpture* consisting of very numerous close and fine radiate riblets, distinctly wavy, crossed by very fine close concentric threads, nodulous at the points of intersection. *Colour* white, buff, or tawny. *Anterior slope* straight or slightly convex, posterior slope straight or lightly concave. *Foramen* keyhole-shaped, very little in front of the middle, its plane nearly horizontal. *Interior* white, smooth, only microscopically roughened, and with indistinct narrow radiate folds; foramen surrounded by a triangular strong white callus; muscular impression distinct. *Margin* smooth, sharp, sometimes finely denticulate.

Length, 15·5 mm.; breadth, 11·5 mm.; height, 5 mm. (type). Length, 23 mm.; breadth, 16 mm.; height, 6 mm. (my largest specimen).

Type in the Dominion Museum, Wellington.

Hab.—Stewart Island, in 15 fathoms (type); Port Pegasus, Stewart Island, in 18 fathoms; Snares, in 50 fathoms (Captain Bollons).

Fossil in the Pliocene.

Fam. **TROCHIDÆ**, d'Orbigny.

Animal similar in general form to the *Turbinidæ*. Visceral mass and shell spirally coiled. Epipodial line bearing 1, several, or many smooth or ciliated cirri on each side; head with a short, broad rostrum; intertentacular lobes simple or digitated, separate or united across the front, sometimes obsolete. A single ctenidium; eyes open Jaws developed or absent.

Shell nacreous within, conical, pyramidal, subglobose, turbinate or helicoid; aperture entire, tetragonal or rounded; persistome generally not continuous. Operculum circular, thin, entirely corneous, formed of numerous gradually increasing whorls; nucleus central.

The *Trochidæ* are like the *Turbinidæ* in the possession of a nacreous test and in the principal structural characters of the animal. They differ from that family in having a corneous, never calcareous, operculum, which is always multispiral.

The animals are herbivorous. The family is represented by numerous species living in the littoral and laminarian zones, and many are deep-sea forms.

Ordovician to Recent.

The best works on the *Trochidæ* are—Dr. P. Fischer, Monogr. Genre Troque, in Kiener's "Coquilles Vivantes," Paris, 1880; H. A. Pilsbry, Tryon's Man. Conch. (1), vol. xi, 1889.

Subfam. 1. TROCHININÆ.

Animal with frontal lobes; jaws wanting; with 5 lateral teeth on the radula, a sixth obsolete tooth may be present. Shell pearly; peristome disconnected.

KEY TO GENERA.

1. Shell conical, base flattened; spire elevated; last whorl generally carinated; imperforate or false-umbilicate .. TROCHUS.
2. Shell turbinate, base convex; generally imperforate; last whorl mostly convex .. .. MONODONTA.
3. Shell ovate-conic or pyramidal; imperforate; aperture less than half the length of shell .. .. .. CANTHARIDUS.
4. Shell small, conoidal, imperforate or perforate, fine spiral liræ; inner lip callous; last whorl subangled .. .. PHOTINULA.

Genus 1. TROCHUS, Linnæus, 1758.

Trochus, L., Syst. Nat., ed. x, 756. Type: *T. Niloticus*, L. *Pyramidea*, Swainson, Malacology, 1840, 350. *Rochia*, Gray, Guide Syst. Distr. Moll. Brit. Mus., 1857, 148.

Animal with 1 to 4 pairs of cirri upon the epipodial line, which are not ciliated; frontal lobes between the tentacles simple or foliated, distinct or united into a veil. The formula of teeth is $\infty 5 \cdot 1 \cdot 5 \infty$ or $\infty 1 + 5 \cdot 1 \cdot 5 + 1 \infty$. The central and lateral teeth have more or less expanded lateral margins, and bear cusps which are smooth on the cutting-edge, with minute denticles at the sides. A narrow oblong plate, lying between the fifth lateral and the inner marginal tooth, is sometimes present. The central tooth is always widest in the middle, tapering toward the cup and the base.

Shell conical, strong, imperforate or false-umbilicated, the axis always solid, the spire more or less elevated, whorls numerous, generally carinated at the periphery, sometimes rounded, more or less flattened beneath; aperture rhomboidal, very oblique, columella twisted, its edge generally folded or dentate and toothed at base; sculptured usually with spiral beaded ridges.

Distribution.—In all the warmer seas.

The fossil forms appear in the Secondary formation, and have a wide distribution in the Tertiary.

Vernacular Name.—Top-shell.

Remark.—The genus is Indo-Australian, and not represented in the Tertiary of Patagonia. (Von Ihering.)

Subgen. 1. Infundibulum, Montfort, 1810.

Infundibulum, Mft., Conch. Syst., 167. Type: *Trochus concavus*, Gmel. *Infundibulum*, Mft., Man. Conch. (1), xi, 7, 24. *Polydonta*, Schumacher, Essai d'un nouv. Syst., 1817, 231; Ad., G.R.M., i, 414, not of Fischer de Waldheim, 1807. *Carinidea*, Swainson, Treatise on Malac., 1840, 350. *Lamprostoma*, Swains., *t.c.*, 350.

Shell conical, false-umbilicate; columella more or less folded above, its edge straight, oblique, toothed or simple, with or without a tooth at the base.

Indo-Pacific and Australasian province.

Sect. 1. Cœlotrochus, P. Fischer, 1880.

Cœlotrochus, P. Fischer, Coq. Viv., 417. Type: *Trochus tiaratus*, Q. & G.

The false umbilicus very deep and narrow, penetrating deeper than the columella, which is inserted upon its edge, not in the centre of the axis.

Key to Species.

A. False umbilicus wide and very deep; 5 to 8 beaded spiral cords on the penultimate whorl .. .. .. *tiaratus.*
B. False umbilicus narrow and not very deep.
a. Last whorl with a distinct peripheric keel .. .. *chathamensis.*
b. Last whorl biangulate .. .. *oppressus.*

1. Trochus chathamensis, Hutton, 1873. Plate 33, fig. 2.

Polydonta chathamensis, Hutt., C.M.M., 36. *Trochus chathamensis*, Hutt., Man. Conch. (1), xi, 43; Suter, P. Mal. S., ii, 260, fig. in text. *Anthora chathamensis*, Hutton, M.N.Z.M., 94.

Shell small, conical, spirally striated, last whorl keeled, false umbilicus shallow. *Sculpture* consists of 5 to 6 low spiral threads, the lower and upper margins much elevated, especially the former; crossed by broad nodulous radiate ribs, which, however, do not extend over the lower half of the whorl; these ribs are often obsolete; base with subequal spiral liræ. *Colour* white, buff, or pinkish, with oblique longitudinal brownish-purple stripes and spots. *Spire* conical, the sides straight or slightly convex. *Protoconch* regularly conical, pointed, of about 2 whorls, not marked off from the succeeding whorl, smooth, with 2 or 3 spiral red bands. *Whorls* 5, rarely 6, the last 2 rapidly increasing, flat to slightly convex above, concave below before reaching the strong and prominent cingulum; last whorl strongly carinated;

base flat. *Suture* superficial, with a nodulous border below. *Aperture* oblique, rhomboidal. *Outer* and *basal lip* a little eonvex, forming a sharp angle where they meet. *Columella* oblique, slightly coneave, with an almost impereeptible fold above. *False umbilicus* small, smooth, almost filled up. Angle of spire, 70°.

Diameter, 9 mm. ; height, 7·5 mm. (type). Diameter, 11 mm. ; height, 8 mm. (Auekland Island speeimen).

Type in the Dominion Museum, Wellington.

Hab.—Chatham Islands (type) ; Foveaux Strait, in 15 fathoms ; Wet Jaeket Arm, near Resolution Island, in 12 fathoms (Captain Bollons) ; Snares, in 50 fathoms (Captain Bollons) ; Bounty Islands, in 50 fathoms (Captain Bollons) ; Auekland Islands (Captain Bollons).

Remark.—The specimens from deep water have no longitudinal colour-markings.

Fossil in the Pliocene.

Subsp. dunedinensis, Suter, 1897.

Trochus oppressus, Hutt., var. *dunedinensis*, Suter, P. Mal. S., ii, 261.

Distinguished from the speeies by the lowest cord of the spire-whorls being much less prominent, the last whorl in eonsequence having no keel, but an angularly rounded periphery. The radiate broad ribs are either absent or reduced to nodules below the suture. The eolour is greenish-brown, with indistinet oblique and olive-blaek stripes. Angle of spire, 70°.

Diameter, 7·5 mm. ; height, 7·5 mm. (type).

Type in my colleetion.

Hab.—Dunedin Harbour, under stones (H. S.).

Remarks.—On re-examining my specimens I found them to stand much nearer to *T. chathamensis* than to *T. oppressus*. The absenee of the strong keel on the body-whorl gives it at first sight a eloser resemblance to the latter species, though there is no upper angle on the body-whorl.

2. Trochus oppressus, Hutton, 1878. Plate 38, figs. 2, 2*a*.

Gibbula oppressa, Hutt., J. de Conch., xxvi, 1878, 34 ; Man. Conch. (1), xi, 232, pl. 40. f. 4, 5. *Trochus oppressus*, Suter, P. Mal. S., ii, 261.

Shell small, conieal, somewhat solid, lustreless, with a false umbilicus. *Sculpture :* The entire surfaee elosely finely spirally striate, the striæ of the base becoming eoarser toward the axis. *Colour* dark olive-brown or greenish, minutely tessellated all over with a slightly darker shade of the same hue. *Spire* eonieal. *Protoconch* conieal, small, 2 slightly spirally striated whorls. *Whorls* 5, those of the spire keeled above the middle, body-whorl biangular ; base rather flattened. *Suture* slightly impressed. *Aperture* oblique, subquadrangular, iridescent and slightly lirate within. *Peristome* sharp, discontinuous. *Outer* and *basal lip* convex, with a narrow opaque margin within, which is

smooth. *Columella* oblique, straight, in adult specimens with a few inconspicuous plications above. *Umbilicus* filled with callus, leaving only a slight pit.

Diameter, 6 mm.; height, 5·5 mm. (type).

Dentition.—Hutton, T.N.Z.I., xv, 124, pl. 14, f. M.

Type in the Otago Museum, Dunedin.

Hab.—Auckland (type); Hauraki Gulf (H. S.); East Cape; Lyall Bay; Taumaki Island, west coast of South Island, in 10 fathoms (Captain Bollons); Chatham Islands; Bay of Islands.

3. **Trochus tiaratus**, Quoy and Gaimard, 1834. Plate 39, fig. 2.

Trochus tiaratus, Q. & G., Voy. Astrol., Zool., iii, 1834, 256, pl. 64, f. 6–11; Man. Conch. (1), xi, 42, pl. 12, f. 72–74; Suter, P. Mal. S., ii, 260. *Anthora tiarata*, Q. & G., M.N.Z.M., 94. *Trochus delicatulus*, Philippi, Zeitschr. Malak., 1846, 105. *Polydonta elegans*, Gray, in Yate's N.Z., 1835, 309.

Shell depressed conical, rather thin, apex acute, with a deep and smooth false umbilicus. *Sculpture* above consisting of spiral liræ, about 5 to 8 on each whorl, cut into close oblique beads, the interstices obliquely finely striate, one or two of the broader ones usually with a central riblet; base with 8 to 12 spiral beaded cords, stronger and much finer ones usually alternating. *Colour* whitish, sometimes greyish-green, finely tessellated with reddish-brown, the tessellations formed by the disintegration of narrow radiating stripes, which are on the base frequently continuous; colour lemon-yellow when eroded. *Spire* conical, often depressed, the outlines slightly convex. *Protoconch* small, convex, consisting of two smooth whorls. *Whorls* 5 to 5½, nearly planulate, but the upper margin of each whorl prominent and projecting beyond the periphery of the preceding; last whorl carinated or sharply angled at the periphery; base nearly flat. *Suture* impressed. *Aperture* subrhomboidal, smooth within, pearly. *Outer lip* sharp, convex, margined inside with a narrow white callus; basal lip straight. *Columella* oblique, nearly straight, with a distinct fold above, inserted upon the side of the false umbilicus; *umbilical area* white or yellow, smooth, but partly filled by a white callus, not tapering to a point.

Diameter, 13·5 mm.; height, 10 mm. Diameter, 19 mm.; height 17 mm.

Dentition.—Hutton, T.N.Z.I., xiv, 165, pl. 7, f. N; Man. Conch. (1), xi, pl. 50, f. 5 (top fig. on left side, should be 4).

Type in the Mus. Hist. Nat., Paris.

Hab.—Coasts of the North and South Islands, on rocks near low-water mark; Chatham Islands, where a much depressed form occurs; Hauraki Gulf, in 25 fathoms. The type is from Tasman Bay.

Fossil in the Pliocene.

Maori.—Mimiti (*fide* Quoy and Gaimard).

Sect. 2. Anthora, Gray, 1857.

Anthora, Gray, Guide Syst. Distr. Moll. Brit. Mus., 148. Type: *Polydonta tuberculata*, Gray.

Shell elevated, conical, more or less granulose above, lirate below; base plano-concave or flat, false umbilicus shallow, with 1 to 4 ribs, outer and basal lips smooth within; columella oblique, with a small fold above, its edge simple.

Key to Species.

A. Shell with 5 beaded spiral lirae on the penultimate whorl; umbilicus with 3 to 4 distant spiral ribs .. .. .. *viridis.*
B. Shell with 4 to 6 rope-like cinguli on the penultimate whorl; umbilicus with 1 spiral rib, sometimes grooved in the middle .. .. *camelophorus.*

4. Trochus camelophorus, Webster, 1906. Plate 33, fig. 3.

Trochus camelophorus, Webster, T.N.Z.I., xxxviii, 1905 (1906), 309, pl. 39, f. 1, 1*a*. *T. conus*, Gmelin: Suter, T.N.Z.I., xxxviii, 323, not of Gmelin.

Shell solid, conical, pink, false-umbilicate. *Sculpture:* Rounded cinguli of unequal thickness, with rope-like markings, 5 to 6 on the penultimate whorl; regular radiate riblets cross the cinguli, slightly beading or granulating them; base with 5 to 6 flat spiral ribs, separated by slightly narrower furrows, the whole ornamented with close and fine radiate striæ. *Colour* rose, with darker markings above the periphery of the last whorl; base yellowish-white, with radiate stripes and spots of light brown. *Spire* conical, with a rounded apex. *Protoconch* 2-whorled, with traces of spiral sculpture. *Whorls* 5½, slightly shouldered above, flat, the last sharply angled at periphery. *Suture* marked by a deep groove behind the first roping of succeeding whorl. *Aperture* subquadrangular, inside slightly pearly. *Outer* and *basal lip* slightly convex, forming an acute angle at their junction. *Columella* slightly oblique, with a distinct fold above, rounded, and smooth. The *false umbilicus* is not very deep, and with a strong spiral fold, which is sometimes distinctly grooved, thus havi the appearance of 2 spiral ribs lying close together.

Diameter, 12 mm.; height, 10 mm. (type). Diameter, 11·5 mm.; height, 11 mm. (specimen in my collection).

Type in Mr. W. H. Webster's collection.

Hab.—Cape Maria van Diemen.

5. Trochus viridis, Gmelin, 1790. Plate 8, fig. 9.

Trochus viridis, Gmel., Syst. Nat., ed. xiii, 3572: Man. Conch. (1), xi, 43, pl. 3, f. 16, 17; x, pl. 40, f. 21: Suter, P. Mal. S., ii, 261. *Anthora viridis*, Gmel.: Hutton, M.N.Z.M., 94. *Polydonta tuberculata*, Gray, Dieff. N.Z., 239. *Anthora tuberculata*, Gray: Hutton, M.N.Z.M., 93. *Trochus acinosus*, Gould, U.S. Expl. Ex., 179, f. 217. *T. fulvolabris*, Hombr. & Jacq., Voy. P.S., v, 56, pl. 14, f. 14–16. *Polydonta tritonis*, A. Ad., P.Z.S., 1854, 132.

Shell conical, solid, false-umbilicate. *Sculpture* of upper surface consisting of 5 series to each whorl of rounded bead-like granules,

between which are visible numerous very minute spiral striæ, in the interstices of which oblique incremental striæ are prominently shown under a lens; base concentrically striate, the striæ unequal, disappearing toward the outer edge. *Colour* dull grey, whitish, or greenish. *Spire* conic, with nearly straight outlines, apex acute. *Protoconch* very small, $1\frac{1}{2}$ whorls, which have a slightly rugose surface. *Whorls* about 7, nearly planulate, or sometimes a little bulging at the upper and lower margins, the last whorl strongly angled or carinate at the periphery; base plano-concave. *Suture* rather deep. *Aperture* suboval to quadrangular, nacreous within. *Outer lip* convex, sharp, with a smooth marginal band inside; the outer part narrow, white, and opaque; the inner part broader, iridescent, and smooth; further in lirate. *Basal lip* thickened, subdentate, uniting with the columella in a regular curve. *Columella* oblique, with a deep fold near its insertion, smooth within. *Umbilical area* with 3 to 4 spiral ribs, interstices nacreous, the umbilicus narrow and deep or partly filled up by a white callus. The parietal wall transversely striate or nearly smooth, with a light-brown callus.

Diameter, 19 mm.; height, 20 mm.

The *animal* is yellowish-brown, foot reddish or purplish-brown; filaments white, 3 on each side. The head-lobes are smooth and rounded, and joined together across the head. The eyes are on rather long white peduncles.

Dentition.—Hutton, T.N.Z.I., xv, 124, pl. 14, f. K.

Type (?).

Hab.—North and South Islands; Chatham Islands: on rocky ground near low-water mark. Brought to England by Captain Cook. Occurs also at Norfolk Island.

Fossil in the Pliocene.

Subgen. 2. Clanculus, Montfort, 1810.

Clanculus, Mft., Conch. Syst., 191. Type: *Trochus pharaonicus*, L. *Clanculus*, Mft., Man. Conch. (1), xi, 8, 47. *Monodonta* (in part), Lamarck and authors. *Fragella*, Swainson, "Shells and Shell-fish," 352. *Otavia*, Risso, Hist. Nat. Eur. Mérid., iv, 1826, 132. *Clanculopsis*, Monterosato, Bull. Soc. Malac. Ital., v, 1879, 222.

Shell conical, conoidal, or turbinate; generally granose-lirate all over, periphery rounded or angular, base flat or convex, false-umbilicate; aperture oblique, usually obstructed by teeth, the outer lip usually lirate or dentate within, columella with a tooth-like fold above, terminating in a tooth at the base; false umbilicus with a crenated border.

The animal bears 4 pairs of tentacular filaments on the epipodial line. The dentition is similar to that of *Trochus*, but the body of the tooth is more expanded, the centrals and laterals bearing large lateral supporting-wings.

Distribution.—Mediterranean, Indian Ocean, and Pacific.

KEY TO SPECIES.

A. Shell elevated conical, columella with a strong biplicate tooth at base .. .. *ringens.*
B. Shell depressed conoidal, columella with a small simple tooth at base .. .. *takapunaensis.*

6. Trochus ringens, Menke, 1843. Plate 38, fig. 3.

Monodonta ringens, Mke., Moll. Nov. Holl. Spec., 14; not of Philippi, 1846.
Trochus ringens, Mke.: Fischer, Coq. Viv., 213, pl. 71, f. 1; Man. Conch. (1), xi, 81, pl. 11, f. 49, 50; Suter, P. Mal. S., ii, 262.

Shell false-umbilicate, conical, spirally cingulate. *Sculpture:* Spirally cingulate above, with 4 elegantly granulate ridges, the upper and lower larger; base with 8–9 granose cinguli. *Colour* yellowish, maculate with chestnut and white. *Spire* conical, sides convex, sharply pointed. *Protoconch* sharply pointed, spirally lirate, of about 2 whorls, white with pink spots. *Whorls* 7, planulate, the last acutely carinated; base slightly convex. *Suture* canaliculate. *Aperture* rhomboidal, oblique, narrow. *Basal margin* sulcate-denticulate. *Columella* strong, callous, oblique, strongly plaited, terminating below in a large biplicate tooth.

Diameter, 11 mm.; height, 10 mm. Sometimes the height exceeds the diameter.

Type (?).

Hab.—Cape Maria van Diemen (C. H. Robson); Mokohinau Island.

Remarks.—My specimen from Mokohinau has a slightly more acute spire; the colour is light brown, with chestnut-brown spots; the outer lip is distinctly lirate within; the margins of the aperture are united across the body-whorl by a rather thick callus, bearing a few liræ. Diameter, 10·5 mm.; height, 12 mm. Angle of spire, 62°.

7. Trochus takapunaensis, Webster, 1906. Plate 33, fig. 4.

Trochus (*Clanculus*) *takapunaensis*, Webst., T.N.Z.I., xxxviii, 1905 (1906), 309, pl. 39, f. 2, 2*a*.

Shell small, depressed conoidal, spirally cingulate. *Sculpture:* Smooth rounded spirals, of which the 2 upper are closer together and the others far enough apart to admit a fine spiral thread in the radially striated hollow between them; above the peripheral spiral on the body-whorl is a narrower one, which appeared in the suture of the third whorl; base with 7 to 8 spirals, separated by furrows of the same width. *Colour* yellow-grey, with very dark irregular patches, all of which shade into white from left to right. *Spire* depressed conoidal, sides convex. *Protoconch* rounded, smooth, of 1½ whorls. *Whorls* 5, slightly rounded, the last carinated at the periphery; base convex. *Suture* canaliculate. *Aperture* rhomboidal, oblique. *Peristome* with numerous irregular denticles, some of them extending far into the shell. *Columella* oblique, arcuated, having a blunt tubercle

on the funnel side, and a long fold transversely wound over the anterior end and passing into the shell. *False umbilicus* deep, funnel-shaped, contracted at the margin by a spiral rib with occasional tubercles.

Diameter, 7·5 mm. ; height, 5 mm.

Type in Mr. W. H. Webster's collection.

Hab.—Takapuna, in shell-sand.

Remark.—The shell has a close resemblance to the Victorian *C. plebejus.* (Hedley.)

Genus 2. Monodonta, Lamarck, 1799.

Monodonta, Lam., Mém. Soc. Hist. Nat., 1799, 74. Type : *M. labio*, L. *Manodonto*, Lam. : Ad., G.R.M., i, 417 ; Man. Conch. (1), xi, 8, 86. *Labio*, Oken. Lehrbuch, 263. *Monodontes*, Montfort, Conch. Syst., ii, 195. *Trochidon*, Swainson, Treat. Malac., 351. *Odontis*, Sowerby, Cat. Tankerville Coll., 53. *Trochulus*, Humphrey. *Monodon*, Schweigger

Animal having long tentacles and 4 pairs of epipodial cirri. The radula has the formula $\infty 1.5 + 1 + 5.1 \infty$. The prominent character of the dentition is the development of the lateral basal angles of the central and lateral teeth into broadly projecting lobes imbricating over the adjacent tooth ; the cusp of the central is wide, shortly reflexed, its edge denticulate at the sides, smooth in the middle.

Shell imperforate, turbinate, ovate or globose-depressed, the periphery rounded ; surface smooth or spirally ridged ; columella simple, arcuate, and spread upon the base at its insertion, below tuberculate, swollen, ending in a tooth, or simple ; outer lip smooth or lirate within.

With the exception of several forms from the west coast of South America, the species are all Old World in distribution, mostly tropical.

Geologically, the genus dates from the Trias.

Subgen. 1. Diloma, Philippi, 1845.

Diloma, Phil., Abbild., &c., i, 1845, 168. Type : *Turbo nigerrimus*, Gmel.

Shell globose or depressed conic ; aperture large, very oblique ; columella not prominent, flattened, not cylindrical, generally concave, arcuate, and slightly denticulate at the base, or smooth.

Sect. 1. Diloma, s. str.

Diloma, Phil., Ad. G.R.M., i, 419 ; Man. Conch. (1), xi, 9, 96.

Shell globose, depressed or conic, imperforate, black ; smooth or spirally grooved ; columella wide, concave, porcellanous ; lip margined with an iridescent band, which extends across the parietal wall.

Diloma has been restricted by Fischer to the South American species, but two are found on the coasts of New Zealand. The only diagnostic character separating these from the other Australasian forms is the band of nacre extending across the parietal wall, connecting the terminations of the peristome.

KEY TO SPECIES.

A. Shell without spots, colour mostly bluish-black, outer lip not or very narrowly black-margined within .. .. .. *nigerrima*
B. Shell with or without yellow spots, colour purplish-black, outer lip conspicuously black-margined within .. .. *coracina.*

1. **Monodonta coracina,** Troschel, 1851. Plate 38, fig. 4.

Trochus coracinus, Troschel, in Philippi, Conch. Cab., 1851, 148, pl. 24, f. 13; Fischer, Coq. Viv., 357, pl. 110, f. 6. *Monodonta coracina*, Trosch., Man. Conch. (1), xi, 103, pl. 19, f. 94; pl. 31, f. 28; Suter, P. Mal. S., ii, 264. *Labio porcifera*, A. Adams, P.Z.S., 1851 (1853), 179, not of Watson. *Diloma nigerrima*, Chemnitz; Hutton, M.N.Z.M., 96; P.L.S. N.S.W., ix, 366, not of Chemnitz nor Gmelin.

Shell small, imperforate, orbicular-conoid, depressed, solid, lustreless. *Sculpture:* Rather distant spiral lirae, sometimes obsolete, crossed by oblique growth-lines. *Colour* purplish-black or black, unicoloured, or sparsely dotted, especially on the base, with yellow. *Epidermis* solid, not easily eroded. *Spire* low and arched, or conical with rounded apex. *Protoconch* of 2 flatly convex whorls, which are finely spirally lirate with very distinct oblique growth-lines. *Whorls* 4 to 5, slightly convex, the last large, concave below the suture, obtusely angulate at the periphery, eroded in front of the aperture; base flatly convex. *Suture* linear, margined below by a low and rather broad pad. *Aperture* very oblique, reddish iridescent and lirate. *Outer lip* convex, sharp, black-edged inside, followed by a white opaque band which continues as a pearly stripe over the umbilical tract, parallel to the columella, and connects the terminations of the peristome. *Umbilical tract* bounded on the outer lower margin by green, grey, or brown. *Operculum* round, light brown, horny, multispiral; nucleus central.

Diameter, 8·5–10 mm.; height, 6–9 mm. Diameter, 17 mm.; height, 19 mm. (specimen from Kawhia).

Dentition.—Suter, P. Mal. S., ii, 265, fig. in text.

Type (?).

Hab.—Coast near Kawhia (H. S.); Wellington Harbour (H. S.); Lyttelton Harbour (H. S.); Sumner, near Christchurch (H. S.); Preservation Inlet; Chatham Islands; Auckland Islands (Captain Hutton).

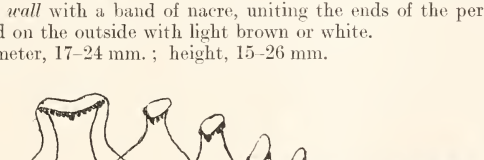
Remark.—This is the most variable species of the genus.

2. **Monodonta nigerrima,** Gmelin, 1790. Plate 38, figs. 5, 5*a*.

Turbo nigerrimus, Gmel., Syst. Nat., ed. xiii, 3597; not *Trochus nigerrimus*, Gmel., a species of *Chlorostoma*. *Diloma nigerrima*, Ad., G.R.M., iii, pl. 47, f. 7, 7*c*; Chenu, Man. i, 358, f. 2658. *Monodonta nigerrima*, Gmel., Man. Conch. (1), xi, 97, pl. 23, f. 77, 78; pl. 20, f. 18. *Trochus araucanus*, d'Orbigny, Voy. Amér. Mérid., Moll., 410, pl. 55, f. 6. *Turbo Quoyi*, Kiener, Spec. et Icon. (Turbo), pl. 29, f. 2; not *Trochus Quoyi*, Phil. *Monodonta porcifera*, Watson: Suter, P. Mal. S., ii, 264, not of Adams nor of Watson. *Trochus Gaudichaudi*, Hupé, in Gay, Hist. fis. Chile, Zool., viii, 1854, 146, pl. 4, f. 4.

Shell imperforate, depressed, globose, solid, black. *Sculpture* consists of numerous close spiral striæ, sometimes nearly obsolete, crossed by oblique growth-lines, which are often strongly developed. *Colour* bluish-black or black, beach-worn specimens reddish or brownish; no spots. *Epidermis* fairly thick and solid, shining in fresh specimens. *Spire* short, conoidal to conical; apex rounded or acute. *Protoconch* consisting of 2 spirally striate and lightly pearly whorls, sometimes reddish. *Whorls* 4 to 5, slightly convex, rapidly increasing, the last usually depressed or subconcave below the suture; base rounded, eroded and iridescent in front of the aperture. *Suture* linear, margined below by a strong cord. *Aperture* large, oblique, greenish iridescent, and closely lirate. *Outer lip* convex, rather thin and sharp, bordered within by an extremely narrow black margin, followed by a broad opaque white band, sometimes brilliantly iridescent. *Columella* concave, obsoletely subdentate below, very broad and flattened or excavated on the face, composed principally of an opaque white layer, which also lines the base, but does not extend to the edge of the lip. *Parietal wall* with a band of nacre, uniting the ends of the peristome, bounded on the outside with light brown or white.

Diameter, 17–24 mm.; height, 15–26 mm.



Teeth of Radula.

Dentition.—Troschel, Das Gebiss d. Schnecken, ii, 236, pl. 24, f. 2; Suter, P. Mal. S., ii, 264, fig. in text (as *porcifera*, Watson).

Type (?).

Hab.—Sumner, near Christchurch (H. S.); St. Clair, near Dunedin (H. S.); Preservation Inlet; Pitt's Island, near Stewart Island (C. Traill); Chatham Island; Auckland Islands (Captain Bollons). Also west coast of South America.

Sect. 2. Neodiloma, P. Fischer, 1885.

Neodiloma, Fisch., Man. de Conch., 820. Type: *Trochus æthiops*, Gmel.
Neodiloma, Fisch., Man. Conch. (1), xi, 9, 98.

Similar to *Diloma*, but without the parietal band of iridescent nacre; surface smooth, grooved, or lirate; unicoloured, spotted, or tessellated; columella with one or two denticles at the base, or smooth.

Australasia.

KEY TO SPECIES.

A. Whorls spirally sulcate.
  a. Columella backed by a distinct pearly band.
    b. Spiral grooves distant, intervening tracts often reticulated with black and white .. .. .. *æthiops.*
    bb. Spiral grooves close together, 7–10 on the penultimate whorl.
      c. Shell black, dull, with irregularly scattered white spots .. .. *morio.*
      cc. Shell greenish-black, shining, sometimes with yellowish spots .. .. *atrovirens.*
  aa. Pearly band wanting, or very short and but slightly iridescent.
    b. Last whorl carinated, base concave .. .. *excavata.*
    bb. Last whorl rounded, base flat .. .. .. *corrosa.*

B. Whorls spirally ridged.
  a. Spiral ridges nodulous, 3 on the penultimate whorl. Colour blackish, with whitish spots on the ridges .. .. *lugubris.*
  aa. Spiral ridges subnodulous, 3–5 on the penultimate whorl. Colour yellowish, with oblique radiate purple lines .. *subrostrata.*

3. Monodonta æthiops, Gmelin, 1790. Plate 39, fig. 3.

Turbo æthiops, Gmel., Syst. Nat., ed. xiii, 3596. *Monodonta æthiops*, Gmel., Man. Conch. (1), xi, 98, pl. 19, f. 99, 100; pl. 20, f. 19; Suter, P. Mal. S., ii, 262. *Trochus zelandicus*, Q. & G., Voy. Astrol., Zool., iii, 1834, 257, pl. 64, f. 12–15. *Monodonta reticularis*, Gray, Wood's Suppl., f. 21. *? Labio concolor*, A. Ad., P.Z.S., 1851, 180.

Shell imperforate, globose-conoid, solid, thick. *Sculpture* consists of distant narrow spiral grooves, the intervening tracts ornamented with close, fine, oblique, lamellose, radiate striæ. *Colour* blackish or greenish, usually encircled by series of narrow white marks, formed by the interruption of numerous longitudinal white lines by narrow spiral black stripes. *Epidermis* lamellose. *Spire* conic, with the apex rounded. *Protoconch* mostly eroded, spirally lirate, flatly convex. *Whorls* 5, convex, rapidly increasing; base convex, eroded and subconcave in front of the aperture. *Suture* impressed, linear. *Aperture* large, oblique and expanded, pearly, lirate. *Outer lip* regularly convex, sharp, with a black edge, often spotted with white; then bounded by a rather broad pearly band, and this is followed by a broad opaque white callosity. *Columella* short, concave, white, obtusely bidentate at the base. The *umbilical tract* is very broad, subconcave, bounded on the outer lower margin by a dark-brown streak. The pearly band of the outer lip is continued over the parietal wall to the middle of the umbilical tract, sometimes continuous with the pearly band of the basal lip, forming a complete circle.

Diameter, 25–30 mm.; height, 25–33 mm. Diameter, 26 mm.; height, 25 mm. (specimen from Kawhia).

Dentition.—Troschel, Das Gebiss d. Schnecken, ii, pl. 23, f. 3; Hutton, T.N.Z.I., xv, 125, pl. 15, f. A; Man. Conch. (1), xi, pl. 50, f. 12.

Type (?).

Hab.—Throughout New Zealand; Chatham and Auckland Islands. Brought to England by Captain Cook.

This is the most common species of the genus.

Fossil in the Pliocene.

4. **Monodonta atrovirens**, Philippi, 1851. Plate 38, fig. 6.

Trochus atrovirens, Phil., Conch. Cab., 148, pl. 24, f. 12. *Monodonta atrovirens*, Phil.: Fischer, Coq. Viv., 373, pl. 114, f. 1; Man. Conch. (1), xi, 110, pl. 22, f. 48–50; Suter, P. Mal. S., ii, 263.

Shell orbiculate-conoidal, solid, imperforate, greenish-black. *Sculpture* consisting of spiral narrow sulci, 7 to 9 on the penultimate whorl, the flat cinguli crossed by close and fine lines of growth; base with about 7 sulci, a little closer together. *Colour* greenish-black, very often with irregularly scattered yellowish dots. *Epidermis* shining, often eroded on the spire, but seldom rubbed off. *Spire* depressed conoidal, sides very convex, apex sharp. *Protoconch* conic, small, of $2\frac{1}{2}$ smooth whorls. *Whorls* 6, rapidly increasing, slightly convex and depressed above, last whorl rounded at the periphery; base flatly convex. *Suture* impressed, margined below by a cingula much broader than the succeeding ones. *Aperture* subrhomboidal, pearly and lirate within. *Outer lip* convex, sharp, black-edged, then a broad silvery band, often followed by a broad white and opaque callosity. *Columella* oblique, nearly straight, nodulous at the base, the callus extending on the inner side of the basal lip. *Inner lip* broadly expanded, bounded by green or blackish-green; a distinct tongue-shaped pit at the centre of the *umbilical tract*, extending downward to the basal lip.

Diameter, 14–23 mm.; height, 9–17 mm.

Dentition unknown.

Type (?).

Hab.—Tasman Bay (type); Hauraki Gulf (H. S.); west coast of the North Island; Lyall Bay (H. S.); Te Onepoto, near Lyttelton (H. S.); St. Clair, near Dunedin (H. S.).

Remark.—This species is very nearly allied to *M. morio*.

5. **Monodonta corrosa**, A. Adams, 1853. Plate 38, fig. 7.

Labio corrosa, A. Ad., P.Z.S., 1851 (1853), 180. *Diloma corrosa*, Ad.; Hutton, M.N.Z.M., 96. *Monodonta melanoloma*, Menke, Man. Conch. (1), xi, 104, pl. 22, f. 56, 57; Suter, P. Mal. S., ii, 266, not of Menke. *Trochus labio*, L.: Chemnitz, Südländ. Conch., 199, not of Linnæus.

Shell globose-conical, solid, imperforate, surface dull, corroded. *Sculpture* consisting of subobsolete spiral cinguli, about 6 on the penultimate-whorl, about 7 on the base, much closer together; the whole surface with oblique subobsolete growth-striæ. *Colour* dark-purplish, overlaid by a more or less eroded yellowish-white layer, leaving sometimes zigzag bands of purple on the last whorl. *Spire* conic, apex much eroded. *Whorls* about 5, slightly convex, the last

globose, not eroded in front of the aperture; base slightly convex or flat. *Suture* impressed. *Aperture* oblique, nacreous and smooth within. *Outer lip* regularly convex, sharp, bordered by a narrow yellow or white followed by a black strip. *Columella* oblique, short, nearly straight, with 1 or 2 tubercles, white, dilated upon the parietal wall, but not extending to the upper lip. *Umbilical tract* slightly pitted, subconcave, no pearly band.

Diameter, 16 mm.; height, 15 mm.

Dentition unknown.

Type in the British Museum.

Hab.—On mud-flats of the South Island; Heathcote Estuary, near Christchurch (H. S.); Dunedin (Captain Hutton). Brought to England by Captain Cook.

Remark.—Pilsbry wrote to me in 1897: "Your New Zealand species will stand as *M. corrosa*, A. Ad. It is perfectly distinct from the West and South Australian *M. melanoloma*. Of course, my description and figures refer to *corrosa*, for at that time I had not seen the true Australian *melanoloma*."

Fossil in the Pliocene.

Subsp. **undulosa**, A. Adams, 1853.

Chlorostoma undulosum, A. Ad., P.Z.S., 1851 (1853), 182. *Monodonta corrosa*, subsp. *undulosa*, A. Ad., Man. Conch. (1), xi, 105, pl. 22, f. 45–47; Suter, P. Mal. S., ii, 267. *Trochus undulosus*, A. Ad., Ereb. & Ter., 4, pl. 1, f. 15. *T. attritus*, Hombr. & Jacq., Voy. P.S., 57, pl. 14, f. 19, 20. *Labio Hectori*, Hutt., C.M.M., 37. *Diloma Hectori*, Hutt., M.N.Z.M., 95.

Larger than the species, and the spiral sculpture more distinct. Colour yellowish, with undulating lines of dark purple. Aperture sometimes faintly lirate within.

Diameter, 20–22 mm.; height, 17–18 mm.: 19 mm. by 16 mm. (type).

Dentition unknown.

Type in the British Museum.

Hab.—From Sumner to Dunedin; on rocks, not common.

Subsp. **plumbea**, Hutton, 1883. Plate 38, fig. 8.

Diloma plumbea, Hutt., T.N.Z.I., xv, 126. *Monodonta melanoloma*, Menke, subsp. *plumbea*, Hutt., Man. Conch. (1), xi, 105, pl. 20, f. 15–17; Suter, P. Mal. S., ii, 267.

Shell globose-conic, imperforate, solid. *Sculpture* consists of obsolete coarse lirae on the last whorl only. *Colour* dull purplish, spire usually eroded, white. *Spire* conical, acute. *Whorls* 4 to 5, flatly convex; base flat. *Suture* superficial. *Aperture* as in the species, but the *outer lip* margined within only by black. *Inner lip* spreading broadly over the lower part of the parietal wall and umbilical tract, bordered outside by black; no pearly band.

Diameter, 16 mm.; height, 14·5 mm.

Dentition.—Hutton, T.N.Z.I., xv, pl. 15, f. E.

Animal like *M. æthiops*, the foot being margined with a band of black-and-white transverse stripes.

Type in the Canterbury Museum, Christchurch.

Hab.—Sumner; Lyttelton; Banks Peninsula to Dunedin: under stones near low-water mark; rather rare.

6. **Monodonta excavata**, Adams and Angas, 1864. Plate 38, fig. 9.

Trochocochlea excavata, Ad. & Ang., P.Z.S., 1864, 37. *Monodonta excavata*, Ad. & Ang., Man. Conch. (1), xi, 109, pl. 35, f. 1–3; Suter, P. Mal. S., ii, 265. *Trochocochlea constricta*, Lam.: Hutton, J. de Conch., 1878, 33, not of Lamarck.

Shell small, depressed conical, imperforate, base concave. *Sculpture* consisting of numerous spiral sulci, crossed by distinct oblique growth-lines, the latter predominant on the last whorl; base with 3 to 4 very distinct spiral sulci. *Colour* light green, closely maculated and mottled in minute pattern with dark olive, the markings sometimes assuming the form of obliquely descending dark bars. *Spire* conoidal, the apex mostly eroded, whitish. *Whorls* 4, the last conic above, flattened beneath, carinate at the periphery. *Suture* well impressed. *Aperture* occupying almost the entire surface of the base, large and very oblique, pearly and smooth within. *Outer lip* acute, arcuate, with a black edge followed by an opaque white band. *Columella* subhorizontal, its edge arcuate, thin, acute, extending below upon the base and forming a ledge within the basal lip. *Umbilical tract* very large, concave, white, bounded by light brown; a tongue-shaped pointed short band, but slightly pearly, extends from the basal lip toward the centre of the umbilical tract.

Diameter. 6 mm.; height, 5 mm. Diameter, 11·5 mm.; height, 10 mm. (specimen from Greymouth).

Dentition.—Hutton, T.N.Z.I., xv, 126, pl. 15, f. F.

Type in the British Museum.

Hab.—West coast of the North and South Islands; Manukau Heads; Cape Egmont; Greymouth; Chatham Islands.

7. **Monodonta lugubris**, Gmelin, 1790. Plate 38, fig. 10.

Trochus lugubris, Gmel., Syst. Nat., ed. xiii, 3583. *Monodonta lugubris*, Gmel., Man. Conch. (1), xi, 100, pl. 19, f. 93; pl. 35, f. 24, 25: Suter, P. Mal. S., ii, 265. *Trochus cingulatus*, Q. & G., Voy. Astrol., Zool., iii, 1834, 259, pl. 64, f. 16–20, not of Brocchi nor Menke. *Monodonta angulatum* (misprint for *cingulatum*), Gray, Dieff. N.Z., ii, 238. *Trochus Gaimardi*, Phil., Conch. Cab., 211, pl. 31, f. 7–9. *T. Bernardi*, Récluz, J. de Conch., 1852, 166, pl. 7, f. 5. *T. sulcatus*, Wood, Ind. Test. Suppl., pl. 6, f. 40, not of Martyn nor Lamarck. *T. bicanaliculatus*, Dunker: Philippi, Conch. Cab., 202, pl. 30, f. 6.

Shell small, solid, thick, imperforate, depressed conic, blackish, with strong spiral ridges. *Sculpture* consisting of strong spiral nodulous ridges, 3 on the penultimate whorl, interstices with 3 to 4 fine cinguli; base concentrically lirate, the liræ coarsely granulose, about

5 in number. *Colour* black or greenish-black, dotted upon the ribs with yellowish or white. *Epidermis* solid, dull, not easily rubbed off. *Spire* conic, more or less depressed, apex acute. *Protoconch* small, spirally lirate, regularly conoidal. *Whorls* 5, the last depressed, angulate at the periphery; base flat. *Suture* linear, indistinct. *Aperture* very oblique, iridescent, lirate. *Outer lip* convex, angled below, edged with black, then nacreous, and lined with opaque white, the thickening sometimes slightly notched at the place of the periphery. *Columella* oblique, slightly concave, flat, opaque white, backed by a nacreous band coming from the basal lip and reaching as far as the centre of the umbilical tract.

Diameter, 13–15 mm.; height, 9–13 mm.

Dentition unknown.

Type (?).

Hab.—From Bay of Islands to Stewart Island; under stones between tide-marks. Not common, but more abundant in Cook Strait than further north or south. Brought to England by Captain Cook.

Fossil in the Pliocene.

8. Monodonta morio, Troschel, 1851. Plate 39, fig. 4.

Trochus morio, Trosch., in Philippi, Conch. Cab., 142, pl. 24, f. 3. *Monodonta morio*, Trosch., Man. Conch. (1), xi, 102, pl. 35, f. 26, 27; Suter, P. Mal. S., ii, 263. *M. melaloma*, var. *guttata*, Hutton, P.L.S. N.S.W., ix, 367; Man. Conch. (1), xi, 105. *Trochus* (*Diloma*) *porcifer*, A. Ad.: Watson, Chall. Rep., xv, 67, pl. 4, f. 12, not of Adams.

Shell semiglobose to conical, solid, black, imperforate. *Sculpture* consisting of numerous spiral sulci, about 10 on the penultimate whorl, crossed by very fine growth-lines; the same ornamentation, usually more distinct, upon the base. *Colour* black, with irregularly scattered white dots. *Epidermis* dull, easily worn off. *Spire* low and arched to elevated conoidal, sides strongly convex. *Protoconch* always eroded, flatly convex, smooth. *Whorls* about 5, rapidly increasing, slightly depressed below the suture, then convex, the last whorl rounded or subangled at the periphery; base but little convex. *Suture* linear, not much impressed. *Aperture* very oblique, silvery with a greenish lustre, closely lirate. *Outer lip* convex, sharp, edged with black or blackish-green, followed by a narrow silvery lirate band, and inside this there is in quite adult specimens a broad band of opaque white. *Columella* oblique, nearly straight, nodulous, white, continued as a broad opaque white band inside the pearly edge on the basal lip. *Umbilical tract* broad, bounded by dark green, and with a pearly impression, the continuation of the band on the lower lip.

Diameter, 14–19 mm.; height, 12–20 mm.

Dentition unknown.

Type (?).

Hab.—North and South Islands, as far south as Preservation Inlet; rather common on rocks and under stones between tide-marks.

Remark.—This species shows a good deal of variation.

9. **Monodonta subrostrata**, Gray, 1835. Plate 38, fig. 11.

Monodonta subrostrata, Gray: Yate, N.Z., 308; Man. Conch. (1), xi, 101, pl. 19, f. 89, 90; Suter, P. Mal. S., ii, 266. *Trochocochlea subrostrata*, Gray: Hutton, M.N.Z.M., 96.

Shell conical, suborbicular, solid, imperforate. *Sculpture* consisting of distant subnodulous spiral ridges, 3 to 6 on the penultimate whorl, interstices without spiral sculpture, the whole crossed by oblique fine and close growth-lines; base with about 6 concentric close ridges. *Colour* yellowish, with undulating longitudinal purple lines. *Epidermis* thin, mostly rubbed off. *Spire* conoidal to conical, acute. *Protoconch* small, conic, acute, smooth, mostly eroded. *Whorls* 5, rapidly increasing, convex, the last slightly angled at the periphery; base convex. *Suture* well impressed, margined below. *Aperture* oblique, silvery, distantly lirate. *Outer lip* convex, sharp, edged with yellow, and often dotted with black; then a narrow band of opaque white. *Columella* oblique, opaque white, nearly straight, broad, and smooth, with an indistinct tooth below, mostly, however, obsolete. *Umbilical tract* rather broad, greyish or yellowish-grey on its outer lower margin; a pearly band extends from the lower lip up to near the centre of the umbilical tract.

Diameter, 13–15 mm.; height, 11–14 mm. Diameter, 23 mm.; height, 24 mm. (my largest specimen).

Dentition.—Hutton, T.N.Z.I., xv, 126, pl. 15, f. G.

Type in the British Museum.

Hab.—Northern part of the North Island, as far south as Tauranga. Abundant on *Zostera* beds and on rocks.

Sect. 3. Chlorodiloma, Pilsbry, 1889.

Chlorodiloma, Pilsbry, Man. Conch. (1), xi, 10, 110. Type: *M. crinita*, Phil. *Latona*, Hutton, P.L.S. N.S.W., ix, 368; not of Schumacher, 1817.

Shell like *Diloma*, but rather more conical, less nacreous; coloration variegated, consisting of fine lines of dark on a lighter ground; columella generally green; umbilicus perforate or subperforate.

Australasia.

10. **Monodonta crinita**, Philippi, 1848. Plate 38, fig. 12.

Trochus crinitus, Phil., Zeitschr. f. Mal., 1848, 103. *Monodonta crinita*, Phil., Conch. Cab., 235, pl. 35, f. 9; Man. Conch. (1), xi, 111, pl. 22, f. 41–44; Suter, P. Mal. S., ii, 267. *Trochocochlea mimetica*, Hutton, J. de Conch., 1878, 32.

Shell globose-conic, narrowly perforate, solid. *Sculpture* consisting of shallow spiral grooves, about 5 on the penultimate whorl, sometimes distinctly spirally ridged; about 7 grooves on the base, getting much closer on approaching the umbilicus; the whole crossed by very fine and close growth-lines. *Colour* light cinereous, longitu-

dinally marked with numerous narrow regularly spaced olive lines, the first whorls often bright-orange coloured. *Spire* conic, sides convex. *Protoconch* small, conical, consisting of 3 smooth convex whorls. *Whorls* 5, convex, the last subangled at the periphery; base flatly convex. *Suture* linear. *Aperture* oblique, iridescent and lirate within. *Outer lip* convex, sharp, narrowly edged with black, followed by a white opaque band. *Columella* oblique, arcuate, not very thick, white-edged, obtusely dentate below. *Umbilicus* partly covered; umbilico-columellar area bright green.

Diameter, 16–18 mm.; height, 17 mm.

Dentition unknown.

Type of the *T. mimetica* in the Otago Museum, Dunedin.

Hab.—On *Zostera* beds in Auckland Harbour; scarce (T. F. Cheeseman). Australian coasts.

Genus 3. Cantharidus, Montfort, 1810.

Cantharidus, Mft., Conch. Syst., ii, 1810, 251. Type: *Limax opalus*, Martyn. *Cantharis*, Fér. *Elenchus*, Swainson, Treat. Mal., 1840, 351.

Animal having the eye-bearing peduncles long and the tentacles ciliiform; there are 3 pairs of epipodial cirri; the foot is short, obtuse behind. Formula of teeth of radula $\infty\ 5 + 1 + 5\ \infty$. The central tooth has a body with broadly expanded supporting-wings, a narrowed neck, which bears a simple cusp; this peduncle has on each side delicate wings, identical with those found in several species of *Gibbula*. The lateral teeth, 5 on each side, increase in size from the inner to the outer one; this peculiarity, together with that of the central tooth, will enable one to recognise a radula of this genus at a glance. The inner lateral is slender, narrowed toward the cusp, like the centrals, and sometimes bearing a lamella behind the peduncle. The outer laterals are very broad, with one or several denticles on the cusp. There are no jaws.

Shell ovate-conic or pyramidal, imperforate, smooth or spirally sculptured outside, brillantly iridescent within; colours generally bright and variegated; aperture less than half the length of the shell, longer than wide, ovate; columella usually more or less folded or toothed near the base.

Distribution.—Australasian seas.

Fossil in the Pliocene.

This genus is also Indo-Australian, like *Trochus*.

Subgen. 1. Cantharidus, Montfort.

Sect. 1. Cantharidus, s. str.

Shell rather thin, ovate-pointed, whorls striated or smooth; columella rather straight, simple, not toothed.

KEY TO SPECIES.

A. Spiral sculpture not conspicuous, subobsolete.
  a. Shell large, height to 45 mm., obsoletely distantly grooved, whitish, with longitudinal zigzag markings of purple .. *opalus.*
  aa. Finely densely spirally striate to nearly smooth. Deep purple, apex pink. Aperture less than half the length of shell .. .. *pruninus.*
  aaa. Small, with fine spiral striæ, last whorl expanded. Aperture half the length of shell .. .. .. *dilatatus.*
B. Spiral sculpture very conspicuous.
  a. Spiral cinguli adorned with fine spiral striæ, growth-lines lamellose striate .. .. *purpuratus.*
  aa. Spiral cinguli smooth or slightly beaded, growth-lines fine and close.
    b. Spire conical, elevated.
      c. Cinguli sometimes moniliform, grooves narrow; greenish or white, with red spots on cinguli .. *sanguineus.*
      cc. Distantly spirally lirate; bluish or greenish black, no colour-markings .. .. .. *tenebrosus.*
    bb. Spire depressed conical.
      c. Globosely conical; white, with pinkish-brown cinguli. Last whorl rounded .. .. *rufozona.*
      cc. Depressed conical, whorls a little shouldered, cinguli flat and broad, grooves deep; cinereous, with white and red colour-markings. Last whorl angled .. .. *pupillus.*

1. **Cantharidus dilatatus**, Sowerby, 1870. Plate 33, fig. 5.

Elenchus dilatatus, Sow., P.Z.S., 1870, 251. *Cantharidus dilatatus*, Sow., Man. Conch. (1), xi, 148 (copy of Sowerby's description); Suter, P. Mal. S., ii, 272, fig. in text (not showing expansion of last whorl). *Chrysostoma simulata*, Hutton, C.M.M., 36. *Gibbula simulata*, Hutt., M.N.Z.M., 102. *Cantharidus simulatus*, Hutt., P.L.S. N.S.W., ix, 363.

Shell small, conical, imperforate, spirally striated. *Sculpture* consisting of numerous fine and inconspicuous spiral striæ, more distinct and a little further apart on the base. *Colour* cinereous, pink, or pinkish-brown, usually with white markings near the suture or tessellated with white; sometimes a broad dark-brown band encircling the periphery of the whorls, and 1 on the centre of the base; white zigzag bands are sometimes adorning the last 2 or 3 whorls. *Epidermis* thin, slightly shining, easily worn off. *Spire* conical, as high as the aperture, a little convex, apex acute. *Protoconch* very small, consisting of $1\frac{1}{2}$ smooth slightly convex whorls. *Whorls* 6, slightly convex, the last obtusely angled at the periphery, and considerably expanded; base flat. *Suture* linear, but little impressed. *Aperture* subrotund, oblique, inside mostly highly bluish-reddish iridescent and finely lirate. *Outer lip* strengthened by an inner white callosity. *Columella* vertical, concave. *Inner lip* broadly expanded, covering the umbilicus, and spreading as a broad white callosity over the parietal wall.

Diameter, 8 mm.; height, 8 mm.

Dentition unknown.

Type in the British Museum.

Hab.—East and west coast of the North Island: Hauraki Gulf, East Cape, Hokianga, Manukau Heads, Cook Strait, Bay of Islands. South Island: Banks Peninsula (Iredale). Chatham Islands.

2. **Cantharidus opalus**, Martyn, 1784. Plate 8, fig. 10.

Limax opalus, Mart., Un. Conch., i, fig. 24, not of 1769. *Cantharidus opalus*, Mart.: Hedley, Colon. Mus. Bull., i, 1906, 49. *Trochus iris*, Gmel., Syst. Nat., ed. xiii, 1790, 3580. *Cantharidus iris*, Gmel., Man. Conch. (1), xi, 122, pl. 34, f. 15; Suter, P. Mal. S., ii, 268. *C. zealandicus*, A. Ad., P.Z.S., 1851, 169.

Shell imperforate, elevated conical, angular at the periphery, solid, but not very thick. *Sculpture* consisting of spiral grooves, about 7 on the penultimate whorl, mostly indistinct, crossed by more or less distinct oblique growth-lines; base with about 5 spiral separated narrow ridges, often inconspicuous. *Colour* whitish, tinged with blue on the body-whorl and yellowish or pinkish on the spire, all over closely longitudinally marked with undulating purplish-red streaks, often zigzag, or interrupted into spiral series of articulations. *Epidermis* thin, shining, easily rubbed off. *Spire* elevated conic, sides straight or slightly concave, more or less eroded, and showing the iridescent green nacre at the tip. *Protoconch* conical, small, acute, consisting of $2\frac{1}{2}$ convex smooth and pinkish-brown whorls. *Whorls* 8 to 10, first very slowly, then rapidly increasing, straight or slightly convex, the last distinctly angled at the periphery; base flatly convex. *Suture* well impressed, sometimes subcanaliculate on the lower whorls. *Aperture* ovate-rhomboidal, oblique, lined with iridescent green nacre with red reflections. *Outer lip* thin, slightly sulcate within; there is often a broad opaque white callosity following a greenish edge inside. *Columella* subvertical, generally straight in the middle or slightly projecting. *Inner lip* spreading as a broad white callus a little beyond the columella and over the parietal wall.

Diameter, 30 mm.; height, 40 mm.

Dentition unknown.

Hab.—From Cape Maria van Diemen to Cook Strait; Preservation Inlet; Chatham Islands; Snares; Kermadec Islands. Brought to England by Captain Cook.

Var. **biangulatus**, Suter, 1908. Plate 33, figs. 6, 6*a*.

Cantharidus opalus, Mart., var. *biangulatus*, Suter, P. Mal. S., viii, 22, figs. in text.

Differs from the species by the disproportional expansion of the last whorl, beginning after the first quarter of the volution; it rapidly protuberates, getting broadly shouldered above, flat at the periphery, and having a biangulate outline. There are about 8 whorls. The suture along the swollen part of the last whorl is canaliculate. Aperture subpentagonal; base flatly convex.

Diameter—Maj., 27 mm.; min., 23 mm.: height, 37 mm.

Type in my collection.

Hab.—Cook Strait (Captain Bollons).

3. Cantharidus pruninus, Gould, 1849. Plate 39, fig. 5.

Trochus pruninus, Gld., Proc. Bost. Soc. N.H., iii, 90, 1849; Expl. Exp. Moll., 180, atlas f. 205. *Cantharidus pruninus*, Gld., Man. Conch. (1), xi, 122, pl. 46, f. 60, 61; Suter, P. Mal. S., ii, 268. *Trochus capillaceus*, Phil., Zeitschr. f. Mal., 1848, 102. *T. episcopus*, Hombr. et Jacq., Voy. P.S., pl. 14, f. 9–11.

Shell ovate-conical, imperforate, nearly smooth, deep purple. *Sculpture* consisting of very fine dense spiral striæ, leaving narrow and shallow grooves between them, sometimes nearly obsolete. *Colour* deep purple or reddish-grey, sometimes with a few white dots, apex usually pink. *Epidermis* thin, often shining, easily rubbed off. *Spire* conical, sides slightly convex, apex subacute. *Protoconch* conoidal, consisting of 3 convex spirally striate whorls. *Whorls* 6 to 7, slightly convex, the last rounded or obtusely angular; base flatly convex. *Suture* linear, slightly impressed. *Aperture* less than one-half the length of the shell, ovate, oblique, iridescent within, lirate. *Outer lip* convex, effuse on meeting the basal lip, with a sharp, finely denticulate edge. *Columella* subvertical, with a slight swelling in the middle. *Inner lip* expanded in a callous pad over the umbilical tract; a thin callus on the parietal wall.

Diameter, 16–19 mm; height, 19–30 mm.

Type in the U.S. Nat. Museum, Washington.

Hab.—Auckland and Campbell Islands. The type is from the former.

Subsp. perobtusus, Pilsbry, 1889. Plate 39, fig. 6.

Cantharidus pruninus, Gld., subsp. *perobtusus*, Pils., Man. Conch. (1), xi, 123, pl. 34, f. 1; Suter, P. Mal. S., ii, 269.

Spire short, very obtuse at apex; whorls 5, the last large, descending anteriorly; aperture as long as spire; other characters as in *C. pruninus*.

Diameter, 19 mm.; height, 20 mm.

Type in the collection Acad. Nat. Sci., Philadelphia.

Hab.—Auckland, Campbell, and Macquarie Islands; Sandfly Bay, Otago Peninsula (T. Iredale).

Var. minor, E. A. Smith, 1902. Plate 38, fig. 13.

Cantharidus pruninus, Gld., var. *minor*, E. A. Smith, Voy. "Southern Cross," Moll., 207.

Shell much smaller than the species; not a quarter the size of other examples from the Auckland Islands. In form, colour, and sculpture, however, they are quite similar.

Diameter—Maj., $6\frac{2}{3}$ mm.; min., 6 mm.: height, 8 mm.

Type in the British Museum.

Hab.—Auckland Islands, in 10 fathoms (type); Campbell Island.

4. Cantharidus pupillus, Hutton, 1884. Plate 33, fig. 7.

Cantharidus pupillus, Hutt., P.L.S. N.S.W., ix, 362; not *Trochus pupillus*, Gould (= *Valvatella pupilla*, Gld.); Man. Conch. (1), xi, 130; Suter, P. Mal. S., ii, 270, fig. in text.

Shell conical, imperforate, solid, shining, of variable colour and markings. *Sculpture* consisting of rather broad and flat spiral cinguli, with narrow interstices, 5 to 6 on the penultimate, about 13 on the body whorl, crossed by fine oblique growth-striæ; below the suture and on the periphery of the last whorl 2 cinguli are usually fused together. *Colour:* Specimens from the North Island are cinereous or white, with broad red spots on the upper whorls and below the suture on the last whorl, the remainder being adorned with blood-red dots; sometimes the whole shell is pink, with broad oblique white bands running down the 2 last whorls to the periphery. South Island examples are much duller, the first 3 or 4 whorls are mottled with dark grey and purple, whilst near the suture white spots are found at regular intervals, 6 to 7 on a whorl, forming longitudinal bands on the second and third whorls; the last whorls are dark purple or greenish-brown, with longitudinal narrow streaks of yellow or yellowish-grey. *Spire* depressed conical, usually lower than the height of aperture, sides slightly convex. *Protoconch* small, convex, mostly eroded. *Whorls* 5 to 6, slightly convex, mostly a little shouldered, the last angled at the periphery; base convex. *Suture* impressed. *Aperture* oblique, subrhomboidal, inside pearly and lirate. Outer lip thick, with a white callus inside, which reaches often far into the aperture. *Columella* oblique, arcuate, slightly straightened in the middle. The *inner lip* spreading over the umbilicus, filling it completely, or leaving a small fissure.

Diameter, 7 mm.; height, 8 mm.

Animal.—Hutton, T.N.Z.I., xiii, 202.

Dentition.—*L.c.*, xiv, 165, pl. 7, f. K.

Type in the Canterbury Museum, Christchurch.

Hab.—Banks Peninsula to Dunedin (Captain Hutton); Hauraki Gulf; Manukau Heads; East Cape; Lyall Bay; Lyttelton and Akaroa Harbours; Bay of Islands.

Fossil in the Pliocene.

5. Cantharidus purpuratus, Martyn, 1784. Plate 39, fig. 7.

Limax purpurata, Mart., Un. Conch., ii, f. 68[2]. *Cantharidus purpuratus*, Mart., Man. Conch. (1), xi, 124, pl. 45, f. 44; Suter, P. Mal. S., ii, 270. *Trochus rostratus*, Gmel., Syst. Nat., ed. xiii, 3580. *T. elegans*, Gmel., *l.c.*, 3581. *Phasianella rubella*, Menke, Syn. Meth. Moll., 51 (*teste* Hutton). *Trochus pallidus*, Hombr. & Jacq., Voy. P.S., v, 55, pl. 14, f. 12, 13, not of Forbes. *T. texturatus*, Gould, Bost. Soc. N.H., iii, 90; Expl. Exp., Moll., 181, pl. 12, f. 206. *T. rostratus*, Kiener, Spec. et Icon., pl. 46, f. 1. *T. torosus*, Kiener, *t.c.*, 136, pl. 46, f. 3.

Shell acutely conical, imperforate, fairly solid, whitish or rosy. *Sculpture* consisting of distinct broad and flat cinguli, which are finely

spirally striate, 5 on the penultimate whorl, the interstices narrow, obliquely lamellose-striate; base with 4 cinguli. *Colour* uniformly greenish or yellowish-white, without any markings, or the first whorls red or reddish-green, the remainder whitish, ornamented with rosy oblique longitudinal streaks. *Spire* usually high and conical, but sometimes a little less than the height of the aperture. *Protoconch* conic, acute, spirally striate. *Whorls* 8 to 9, somewhat convex, the last subangled; base convex. *Suture* but slightly impressed. *Aperture* subtrapezoidal, reddish iridescent and sulcate within. *Outer lip* sharp, edged by a white opaque band. *Columella* nearly vertical, with a slight swelling below the middle. *Inner lip* consisting of a narrow white callus, which unites the extremities of the peristome over the body-whorl.

Diameter, 16 mm.; height, 22 mm. Diameter, 20 mm.; height. 32 mm. Diameter, 21 mm.; height, 26 mm.

Dentition and Animal.—Hutton, T.N.Z.I., xv, 124, pl. 14, f. O.

Hab.—From Ngunguru Harbour, in the north, to Banks Peninsula; Kermadec Islands: on rocks and on floating seaweeds (*Macrocystis*). Brought to England by Captain Cook.

Remark.—Having examined a large series of specimens, I came to the conclusion that *T. texturatus*, Gould, cannot be separated as a variety. All well-preserved, not beach-worn, specimens show the secondary sculpture of fine spiral striæ on the cinguli.

Fossil in the Pliocene.

6. Cantharidus rufozona, A. Adams, 1853. Plate 35, fig. 16.

Cantharidus rufozona, A. Ad., P.Z.S., 1851 (1853), 170; Man. Conch. (1), xi, 150 (copy of Adams's description); Suter, P. Mal. S., ii, 273, fig. in text.

Shell globosely conoidal, small, rather thin, imperforate. *Sculpture* consisting of distant rounded spiral cinguli, 5 on the penultimate, 13 on the body whorl, interstices smooth. *Colour* white or cinereous, the spiral riblets rufous or pinkish-brown. *Spire* conoidal, apex acute, sides but slightly convex. *Protoconch* small, conic, whorls about 2, convex and spirally lirate, mostly eroded. *Whorls* about 5, the last rather large, rounded at periphery; base convex. *Suture* impressed. *Aperture* subquadrangular, iridescent and lirate within. *Outer lip* slightly indented, sharp, articulated with pinkish-brown, with an inner opaque white band. *Columella* vertical, white, with a slight tubercle in the middle, often obsolete. *Inner lip* with a small expansion beyond the columella, but perfectly filling up the perforation; a thin white callus on the parietal wall.

Diameter, 5 mm.; height, 6 mm.

Dentition unknown.

Type in the British Museum.

Hab.—Spirit Bay, not uncommon (C. Cooper); Hauraki Gulf (C. Spencer); Lyall Bay (H. S.).

7. Cantharidus sanguineus, Gray, 1843. Plate 33, fig. 8.

Trochus (*Gibbium*) *sanguineus*, Gray, Dieff. N.Z., ii, 238. *Cantharidus sanguineus*, Gray, Man. Conch. (1), xi, 131, pl. 47, f. 92, 93; Suter, P. Mal. S., ii, 271, fig. in text; Ereb. & Ter., 4, pl. 1, f. 12.

Shell small, conical, imperforate, greenish or whitish with blood-red spots. *Sculpture* consisting of spiral cinguli with very narrow grooves between them, 5 to 6 on the penultimate and 10 to 14 on the body whorl; sometimes slightly moniliform; base with about 5 cinguli. *Colour* green, with oblique longitudinal rows of blood-red spots on the cinguli; the first 3 whorls sometimes reddish or brownish with radiate white streaks, below the suture very often tessellated with white, brown, and red. *Spire* elevated conical, acute, sides slightly convex. *Protoconch* conic, of $1\frac{1}{2}$ strongly convex smooth whorls, which are mostly pearly. *Whorls* 6, flatly convex, the last angled at the periphery; base slightly convex. *Suture* impressed. *Aperture* oblique, iridescent and lirate within. *Outer lip* solid, often strengthened within by a white callosity. *Columella* nearly vertical, arcuate. *Inner lip* spread a little over umbilical tract, which is impressed, concave; the parietal wall with a more or less thick callus.

Diameter, 7 mm.; height, 9 mm.

Type in the British Museum.

Hab.—East coast of the North Island to Cook Strait; Chatham Islands: not common.

Fossil in the Pliocene.

Subsp. cælatus, Hutton, 1884.

Cantharidus sanguineus, Gray, subsp. *cælatus*, Hutt., P.L.S. N.S.W., ix, 363; Man. Conch. (1), xi, 131; Suter, P. Mal. S., ii, 272.

Shell smaller, more deeply ribbed, and the ribs narrower, 5 to 7 on the penultimate, 15 to 16 on the body whorl; sometimes obsoletely granose through being crossed by growth-lines. Columella with a slight swelling in the middle. Imperforate.

Diameter, 4·5 mm.; height, 5·5 mm.

Type in the Canterbury Museum, Christchurch.

Hab.—Foveaux Strait (type); Port Pegasus, Stewart Island, in 18 fathoms; Snares and Bounty Islands, in 50 fathoms (Captain Bollons); Whangaroa Harbour (C. Traill).

Subsp. elongatus, Suter, 1897. Plate 38, fig. 14.

Cantharidus sanguineus, Gray, subsp. *elongatus*, Suter, P. Mal. S., ii, 272.

Differs from the species in being narrower, the whorls of the spire slightly shouldered, the riblets more numerous and finer, 10–11 on the penultimate, 18–19 on the body whorl. Colour whitish or light grey, riblets light brown or reddish-brown, dissolved into spots on the base only. Outer lip edged with white and brown dots, followed by

a broad white opaque band ; interior pearly. Aperture quadrangular. Columella nearly vertical, with a slight swelling in the middle. Imperforate.

Diameter, 5 mm. ; height, 7·5 mm.

Type in my collection.

Hab.—Lyall Bay (A. Hamilton).

8. **Cantharidus tenebrosus**, A. Adams, 1853. Plate 38, fig. 15.

Cantharidus tenebrosus, A. Ad., P.Z.S., 1851 (1853), 170 ; Man. Conch. (1), xi, 123, pl. 34, f. 3 ; Suter, P. Mal. S., ii, 269.

Shell conical, elevated, imperforate, rather thick, solid, spirally lirate. *Sculpture* consisting of fine and distant spiral liræ, 6 to 7 on the penultimate, 12 to 16 on the body whorl, crossed by fine close growth-lines. *Colour* dark-bluish or greenish-black, sometimes with a purplish shade. *Epidermis* dull, not very easily rubbed off. *Spire* elevated conical, apex acute or obtusely rounded, sides flatly convex. *Protoconch* small, conic, of about 2 smooth and convex whorls, mostly eroded. *Whorls* about 6, very slightly convex, body-whorl subangular at the periphery ; base very slightly convex. *Suture* slightly impressed. *Aperture* rounded quadrate, oblique, less than half the total length of the shell, slightly iridescent and lirate within. *Outer lip* convex, subangled at the base, narrowly black-edged, bordered by a series of short fine sulcations, beyond which there is a porcellanous thickening. *Columella* subvertical, slightly arcuate, rounded, covering the umbilicus above ; parietal wall with a very thin whitish callosity.

Diameter, 9·5 mm. ; height, 11·5 mm.

Dentition.—Hutton, T.N.Z.I., xiv, 166, pl. 7, f. L.

Type in the British Museum.

Hab.—Throughout New Zealand, mostly on seaweeds.

Fossil in the Pliocene and Miocene.

Subsp. **Huttoni**, E. A. Smith, 1876. Plate 38, fig. 16.

Trochus (Cantharidus) Huttoni, E. A. Smith, J.L.S., xii, 558, pl. 30, f. 20. *Cantharidus tenebrosus*, A. Ad., subsp. *Huttoni*, E. A. Smith, Man. Conch. (1), xi, 123, pl. 34, f. 2 ; Suter, P. Mal. S., ii, 269. *Gibbula plumbea*, Hutton, J. de Conch., 1878, 33.

Shell short-conical, covered perforate, bluish-black, spirally lirate. *Sculpture* consisting of close spiral liræ, 8 to 11 on the penultimate, 17 to 20 on the body whorl, crossed by fine growth-lines. *Colour* bluish or purplish black, the apex mostly worn white. The *inner lip* is more expanded than in the species, completely covering the perforation. All the other characters are the same as in *C. tenebrosus*.

Diameter, 7–10·5 mm. ; height, 10·5–14·5 mm.

Dentition.—Hutton, T.N.Z.I., xiv, 165, pl. 7, f. M.

Type in the British Museum.

Hab.—The same as the species, but more abundant.

Subgen. 2. Bankivia, Beck, 1848.

Bankivia, Beck: Krauss, Die Südafrik. Moll., 105. Type: *B. varians*, Beck.

Shell imperforate, elongated, narrow, conical, thin, but slightly pearly; aperture small, about one-third the length of shell; columella slightly twisted, subtruncated toward the base.

9. Cantharidus fasciatus, Menke, 1830. Plate 38, fig. 17.

Phasianella fasciata, Mke., Synops. Meth. Moll., 141. *Cantharidus fasciatus*, Mke., Man. Conch. (1), xi, 139, pl. 40, f. 28–33; Suter, P. Mal. S., ii, 274. *Phasianella fulminata*, Mke., and *P. undatella*, Mke., *l.c.*, 141. *Bankivia varians*, Beck, in Krauss, *l.c.*, 105, pl. 6, f. 7. *B. purpurascens*, A. Ad., P.Z.S., 1851 (1853), 171. *B. major*, A. Ad., *l.c.*, 171. *B. nitida*, A. Ad., *l.c.*, 172.

Shell elongated, turreted, imperforate, thin, polished, and shining. *Sculpture* (under a lens) very dense, fine spiral striations; base with a few concentric, separated, impressed lines. *Colour* white, creamy, or pink, with spiral bands of pink, purplish-red, or purplish-brown, or narrow oblique zigzag stripes of pinkish-brown, usually with a narrow subsutural band of dark or pinkish. *Epidermis* very thin, shining. *Spire* elevated, slender; apex acute, dark. *Protoconch* small, conical, of 2 convex smooth whorls. *Whorls* about 9, very slightly convex, a little impressed below the suture, the last rounded; base convex. *Suture* linear, superficial, margined below. *Aperture* ovate, smooth and whitish within. *Outer lip* thin, acute. *Columella* sinuous, arcuate above, obliquely truncate below. *Inner lip* narrowly reflexed and spreading as a thin callus over the parietal wall.

Diameter, 8 mm.; height, 19 mm.

Animal unknown.

Type (?).

Hab.—Near Waiwera, Hauraki Gulf; west coast of the North Island; Cook Strait: in 3 to 4 fathoms, on sand; not common. Australia.

Sect. 1. Leiopyrga, H. and A. Adams, 1863.

Leiopyrga, H. & A. Ad., A.M.N.H. (3), xi, 19. Type: *L. picturata*, H. & A. Ad.

Shell perforate, elongated, narrow, somewhat turreted, thin, the whorls convex, rounded, or carinated; aperture oval, small; columella arcuate, not truncated at base.

10. Cantharidus picturatus, H. and A. Adams, 1863. Plate 38, fig. 18.

Leiopyrga picturata, H. & A. Ad., A.M.N.H. (3), xi, 19. *Cantharidus picturatus*, H. & A. Ad., Man. Conch. (1), xi, 140, pl. 45, f. 46–48; Suter, P. Mal. S., ii, 274.

Shell turreted, slender, perforate, thin, shining. *Sculpture* consisting of a spiral ridge on the periphery of the whorls and around the

umbilicus, sometimes, however, obsolete; distant impressed concentric grooves on the base. *Colour* white, with longitudinal undulating or zigzag pinkish or purplish lines, often uniting to form spots at the periphery, or prominently angled there. *Spire* elevated, narrow, sides straight. *Protoconch* small, consisting of 2 convex and nearly smooth whorls, mostly eroded. *Whorls* about 7, convex, more or less carinated at the periphery, the carina exserted above the suture on the spire; base convex. *Suture* margined. *Aperture* oval. *Outer lip* thin. *Columella* thin, arcuate, not truncate. *Inner lip* slightly expanded above, but not covering the umbilicus.

Diameter, 5–7 mm.; height, 8–12 mm.

Animal with a very large thin mantle; the tentacles are large and very long, strongly ciliated with a long deep posterior channel running down their whole length. The eyes are very minute, on the end of rather long and fine tubercles. There are 4 pedal appendages on the right and 3 on the left side, and there are also the 2 head-lappets common to *Trochus*. The teeth are like those of *Margarita* (Watson)

Type in the British Museum.

Hab.—Stuart Island (Stewart Island ?), New Zealand. Australia.

I have not seen any New Zealand specimens.

Subgen. 3. Thalotia, Gray, 1847.

Thalotia, Gray, P.Z.S., 1847, 145. Type: *Monodonta conica*, Gray.

Shell imperforate, elevated conical, thick, solid, granulated or spirally ribbed; periphery rounded or obtusely angular; aperture small, ovate; outer lip thick, crenulated within; columella toothed at base, subtruncated.

11. **Cantharidus conicus**, Gray, 1827. Plate 39, fig. 8.

Monodonta conica, Gray, in Captain King's "Survey of Australia," ii, 479. *Cantharidus conicus*, Gray, Man. Conch. (1), xi, 141, pl. 46, f. 73; Suter, P. Mal. S., ii, 275. *Thalotia pictus*, Wood, Index Test. Suppl., pl. 5, f. 28; A. Adams, P.Z.S., 1851 (1853), 172. *Monodonta turrita*, Menke, Moll. Nov. Holl., 15. *Thalotia Lehmanni*, Kiener, Spec., g. Trochus, pl. 46, f. 2, not of Menke. *T. Woodsiana*, Angas, P.Z.S., 1872, 611, pl. 42, f. 4, 5. *T. dubia*, T.-Woods, P.R.S. Vic., xiv, 58. *T. Troschelii*, Philippi, Conch. Cab., 131, pl. 23, f. 2.

Shell elevated conical, imperforate, solid. *Sculpture:* Whorls of spire encircled by 5 or 6 more or less granose liræ, last whorl with about 13 or 14; growth-wrinkles more or less prominent, very distinct upon the base. *Colour* pinkish or greyish-white, with crimson apex and numerous close longitudinal dark-reddish-brown stripes, often cut into tessellations by the spiral grooves of the surface. *Epidermis* rather thin, dull, mostly rubbed off on the upper whorls. *Spire* straightly conical. *Protoconch* pink, bluntly conical, eroded. *Whorls* about 7, nearly planulate, the last obtusely angular at the periphery; base flatly convex. *Suture* linear, not much impressed. *Aperture*

rhomboidal, reddish iridescent and lirate within. *Outer lip* thick, plicate within. *Columella* straight, denticulate, with a strong basal truncation.

Diameter, 13 mm.; height, 20 mm.

Type in the British Museum.

Hab.—Rangitoto Channel, near Auckland (T. F. Cheeseman); Chatham Islands: scarce. Tasmania and Australia.

Remarks.—Rather variable in sculpture; the spaces between the spiral ribs often occupied by lirulæ.

Genus 4. PHOTINULA, H. and A. Adams, 1854.

Photinula, H. & A. Ad.: Ad., G.R.M., i, 1854, 427. Type: *P. cœrulescens*, King. *Kingotrochus*, von Ihering, 1902.

Animal having an asymmetrical cephalic region, the left epipodial lobe usually absent; there are 4 epipodial tentacles on each side. No jaws. Radula with the central tooth broadly oval and a small reflection, narrow or broad, sometimes minutely denticulate; the 5 lateral teeth increasing in size from the centre outwards; they have a broad reflection with an inner stout cutting-point and 2 to 3 fine denticles on the outer side; uncini with a strong pointed tooth.

Shell imperforate or perforate, conoidal, subdepressed, whorls smooth, generally polished and with fine spiral lines. Aperture large: outer lip sharp; inner lip strongly callous and usually spreading outward and more or less covering the narrow umbilicus. Operculum multispiral.

Distribution.—Austral seas.

Remarks.—Thiele included in his genus *Margarella* our species *P. nitida* and *P. antipoda* because the dentition shows a close resemblance. *Margarella* stands, no doubt, nearer to *Valvatella*, the animal having jaws.

KEY TO SPECIES.

A. Shell narrowly umbilicated, with distinct spiral liræ, about 10 on the penultimate whorl	*nitida.*
B. Shell subperforate or imperforate, a few distant fine spiral liræ ..	*antipoda.*
C. Shell imperforate, very finely and densely spirally striate, about 30 striations on the penultimate whorl	*decepta.*

1. **Photinula antipoda,** Hombron and Jacquinot, 1854. Plate 38, fig. 19.

Margarita antipoda, H. & J., Voy. P.S., v, 58, pl. 14, f. 26–28. *Photinula antipoda*, H. & J., Man. Conch. (1), xi, 217, pl. 33, f. 102–104; Suter, P. Mal. S., ii, 277.

Shell small, globosely conic, subperforate or imperforate, smooth, shining. *Sculpture* consists of a few distant fine spiral striæ, visible only under a good lens, more distinct on the base, and very fine close growth-lines. *Colour* purplish-black, the upper whorls iridescent, mostly with dark-red spiral bands, 1 or 2 on the spire-whorls, 4 to 5 on the body-whorl, sometimes a number of whitish zigzag bands near

the aperture. *Epidermis* very thin, shining. *Spire* conoidal, sides convex, height a little less than that of the aperture. *Protoconch* small, depressed convex, of $2\frac{1}{2}$ smooth whorls, yellowish-white, with 1 or 2 pink spiral bands. *Whorls* 4 to 5, the last large, convex, the last angled or rounded at the periphery; base slightly convex, impressed in the middle. *Suture* linear. *Aperture* large, round, inside smooth and highly iridescent. *Outer lip* convex, sharp, edged with a narrow white opaque band. *Columella* subvertical, arcuate, simple, slightly expanded, and nearly covering up the umbilicus.

Diameter, 8 mm.; height, 8 mm. (type).

Dentition.—Thiele, in Das Gebiss d. Schnecken.

Type in the Mus. Hist. Nat., Paris.

Hab.—Auckland Islands (type); Antipodes and Campbell Islands (Captain Bollons); Snares (Professor Chilton).

Var. **rosea**, Hutton, 1873.

Chrysostoma rosea, Hutt., C.M.M., 36. *Gibbula rosea*, Hutt., Man. Conch. (1), xi, 216; Suter, P. Mal. S., ii, 276. *Margarita rosea*, Hutt., J. de Conch., 1878, 35; M.N.Z.M., 103.

Shell small, globosely conoidal, subperforate, white or greenish, with 4 to 5 spiral blood-red bands and spots of the same colour on the last whorl. All the other characters are the same as in the species, and it is absolutely nothing else but a colour variety of it.

Diameter, 5·75 mm.; height, 3·75 mm. (type). Diameter, 7 mm.; height, 7 mm. (Auckland Islands specimen).

Dentition unknown.

Type in the Dominion Museum, Wellington.

Hab.—Stewart Island (type); Bounty Islands; Auckland Islands; Campbell Island (Filhol); Antipodes Island (Captain Bollons).

Remark.—Specimens from Antipodes Island are yellowish-white and the spiral bands purplish-brown, sometimes red on the spiral whorls.

2. **Photinula decepta**, Iredale, 1908.

Photinula decepta, Iredale, T.N.Z.I., xl, 1907 (1908), 382.

Shell small, globosely conoidal, imperforate, thin, fragile. *Sculpture:* Very finely spirally striated, 30 striations on the penultimate whorl, obscured on the last whorl by growth-lines. *Colour* variable, typical; the 2 apical whorls white or pinkish-white, on the third whorl 2 purplish bands equidistant from the sutures arise; the 4th whorl is wholly purplish-black, as is the last whorl; in some shells these bands persist on to the last 2 whorls, additional bands arising so that on the last whorl 5 distinct bands can be counted; rarely additional minute bands can be seen between these principal bands: in some cases the purple on the last whorl breaks up into irregular dashes: the Shag Point shells are mostly light-coloured; some have

almost a white ground-colour, with 5 separate distant bands; others have a pinkish ground-colour, with darker markings between the principal bands; whilst in some the bands on the last whorl are broken up into dots. *Spire* very short. *Whorls* 5, the last very large, rapidly descending. *Suture* distinctly marked. *Aperture* large, round. *Outer lip* thin, edged with a thin band of white, inside iridescent. *Columella* subvertical, semicurved, expanding as a callus over the umbilicus (Iredale).

Diameter, 12 mm.; height, 13 mm. Diameter, 11 mm.; height, 11 mm.

Animal unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—Sandfly Bay, Otago Peninsula (type); near Cape Saunders; Shag Point, Otago.

3. **Photinula nitida**, Adams and Angas, 1864. Plate 38, fig. 20.

Gibbula nitida, Ad. & Ang., P.Z.S., 1864, 36; Man. Conch. (1), xi, 217, pl. 37, f. 25–27; Suter, P. Mal. S., ii, 277. *Chrysostoma inconspicua*, Hutton, C.M.M., 36.

Shell small, conical, narrowly umbilicate, rather thin, shining. *Sculpture* consisting of very delicate spiral liræ, more prominent on the base, about 10 on the penultimate whorl, 7 to 8 on the base, crossed by very fine, close, oblique growth-lines. *Colour* olive-yellow, grey, or purplish-brown, marked with numerous continuous capillary white spiral lines, and longitudinal olive or brown flames, generally broken into oblong quadrangular tessellations on the spaces between the white lines; sometimes the whole shell is uniformly purplish-brown, bluish-black, or black. *Spire* elevated, with a convex outline, usually a little higher than the aperture. *Protoconch* broadly convex, of 2½ smooth whorls. *Whorls* 6, rapidly increasing, convex, the last slightly angular around the periphery; base flatly convex. *Suture* linear. *Aperture* rounded quadrate, iridescent and lirate within. *Outer lip* very finely crenulated, edged by a narrow border tessellated with black and olive, followed by a broad iridescent callosity. *Columella* vertical, concave, a little expanded above. *Umbilicus* funnel-shaped, half-hidden by the expansion of the columella.

Diameter, 5·5 mm.; height, 6·5 mm. Diameter, 7 mm.; height, 8 mm.

Jaws.—None.

Dentition.—Hutton, T.N.Z.I., xv, 124, pl. 14, f. N.

Type in the British Museum. The type of *C. inconspicua* is in the Dominion Museum, Wellington.

Hab.—Coasts of the North and South Islands; on rocks near low-water mark, but local in distribution.

Remarks.—The peculiar white spiral striæ and longitudinal flames are a fairly constant character.

Subfam. 2. GIBBULINÆ.

Frontal lobes and jaws present. Lateral teeth of radula frequently exceeding 5 on each side. Shell pearly; peristome incomplete.

KEY TO GENERA.

A. Shell auriform, spire short, aperture oval, wide .. .. FOSSARINA.
B. Shell conical.
  a. Shell small, perforate or imperforate, whorls often gibbous near the suture, smooth or spirally ribbed .. GIBBULA.
  aa. Shell rather large, imperforate, with moniliform spiral ribs .. .. CALLIOSTOMA.
C. Shell depressed conical, form of *Solarium*.
  a. Umbilicus partly filled by a prominent spiral funicle or rib .. .. MONILEA.
  aa. Umbilicus wide, without internal funicle .. .. MINOLIA.
D. Shell globose-turbinate, small, whorls granose-lirate; outer lip crenulate; columella with a tooth or notch at base .. EUCHELUS.

Genus 1. GIBBULA, Risso, 1826.

Gibbula, Risso, Hist. Nat. Europe Mérid., iv, 134. Type: *G. magus*, L. *Gibbula*, Risso, Man. Conch. (1), xi, 12, 195. *Phorcus*, Risso, *t.c.*, 133. *Forskälia*, H. & A. Ad., G.R.M., i, 432. *Magulus*, *Glomulus*, *Puteolus*, *Phorculus*, *Tumulus*, *Gibbulastra*, *Colliculus*, Monterosato, Bull. Soc Mal. Ital., 1888, 169–177. *Steromphala*, Gray, P.Z.S., 1847, 146. *Korenia*, Friele. *Eurytrochus*, Fischer, Icon. Coq. Viv., Trochus, 1880, 417. *Calliotrochus*, Fischer, *t.c.*, 418.

Animal having the tentacles long, annulate, ciliiform; epipodial line with 3 pairs of cirri; frontal lobes large, fringed; the ocular peduncles rather short. The radula has the formula $\infty 1.5 + 1 + 5.1 \infty$; the central tooth rhomboidal, constricted above; the outer lateral irregular in form.

Shell usually perforate or umbilicate, conical, the spire moderately elevated; whorls often gibbous or tuberculose beneath the sutures, smooth or spirally ribbed; the last generally angular at the periphery; aperture subrhomboidal; columella oblique, dentate or subsinuous at base; outer lip acute.

The species of *Gibbula* are very numerous, and are nearly all littoral or laminarian in station. The group is distributed through all seas, except upon the coasts of America, which have not a single species.

KEY TO SPECIES.

A. Shell umbilicated.
  a. Smooth or delicately spirally lirate; pink or purplish, with white blotches and zigzag streaks below the suture and around the periphery .. .. *fulminata.*
  aa. Distinctly spirally lirate.
    b. Spiral liræ fine, numerous, about 18 on the penultimate whorl .. .. *tasmanica.*
    bb. Spiral liræ coarse, 7 to 8 on the penultimate whorl .. *scamnata.*

B. Umbilicus closed.
a. Last whorl angled at periphery; aperture a little higher than the spire; finely spirally lirate, tessellated with white .. *Suteri.*
aa. Last whorl carinate at periphery; spire higher than the aperture .. .. *micans.*

Sect. 1. Calliotrochus, Fischer, 1880.

Calliotrochus, Fischer, Icon. Coq. Viv., Trochus, 1880, 417. Type: *G. phasianellus*, Desh.

Shell small, globose, whorls rounded, smooth or spirally striate, thin; aperture rounded; outer lip and columella simple, thin, arcuate; umbilicus narrow.

1. Gibbula tasmanica, Petterd, 1879. Plate 38, fig. 21.

Margarita tasmanica, Pett., Journ. of Conch., ii, 103. *Gibbula tasmanica*, Pett., Man. Conch. (1), xi, 236, pl. 40, f. 20; Suter, P. Mal. S., ii, 276.

Shell small, perforate, globose-turbinate, rather thin, lustreless. *Sculpture* consisting of fine, regular, close spiral lirae, about 18 on the penultimate whorl, crossed by fine oblique growth-lines. *Colour* whitish, tinged with yellow, unicoloured, or marked with a few angular radiating maculations of brown. *Spire* short, outlines convex. *Protoconch* small, consisting of 2 convex and microscopically spirally striate whorls. *Whorls* $4\frac{1}{2}$ to 6, flatly convex, narrowly shouldered in New Zealand specimens, the last obtusely angular at the periphery; base convex, impressed around the umbilicus. *Suture* impressed. *Aperture* oblique, rounded ovate, angular above, broadly rounded below, with a thin iridescent layer of nacre within. *Outer* and *basal lip* thin, inside with a narrow white callus. *Columella* oblique, slightly concave. *Inner lip* spread out over part of the umbilicus and the parietal wall. *Umbilicus* narrow.

Diameter, 5·5 mm.; height, 6 mm. Diameter, 7 mm.; height, 8 mm. (New Zealand specimen of 6 whorls).

Dentition unknown.

Type in the Tasmanian Museum, Hobart.

Hab.—Lyall Bay (A. Hamilton).

Remarks.—The two New Zealand specimens in my collection are distinctly shouldered, and the last whorl is more distinctly angled than in Tasmanian specimens, but otherwise there is no difference. These differences are too slight to separate the New Zealand form as a subspecies.

Sect. 2. Cantharidella, Pilsbry, 1889.

Cantharidella, Pils., Man. Conch. (1), xi, 197. Type: *G. picturata*, Ad. & Ang.

Small forms with much the aspect of tiny *Cantharidus;* usually polished, narrowly or not perforate, conical, elongated.

2. Gibbula fulminata, Hutton, 1873. Plate 38, fig. 22.

Chrysostoma fulminata, Hutt., C.M.M., 36. *Gibbula fulminata*, Hutt., Man. Conch. (1), xi, 216, pl. 43, f. 14–16; Suter, P. Mal. S., ii, 276. *Margarita fulminata*, Hutt., J. de Conch, 1878, 34.

Shell small, globose-conoidal, perforate, solid, nearly smooth. *Sculpture* consisting of very fine distant spiral striæ, often obsolete, but always distinctly visible on the base, crossed by fine and close growth-lines. *Colour* pink, orange, purplish, or olive-brown, generally with a series of white blotches alternating with darker ones below the sutures, a girdle of white blotches around the periphery and often around the umbilicus; the intervening spaces irregularly strigate with darker zigzag streaks or unicoloured. *Epidermis* thin, slightly shining. *Spire* short, the same height as the aperture, outline convex, apex blunt. *Protoconch* depressed conoidal, of 2 slightly convex smooth whorls. *Whorls* 4½ to 5, convex, the last large and angled at the periphery; base convex. *Suture* linear. *Aperture* oblique, rounded quadrate, iridescent and faintly lirate within. *Outer lip* sharp, strengthened inside by a white callus. *Columella* subvertical, concave, slightly straightened in the middle. *Inner lip* spread as a white shining callosity into the umbilical funnel. *Umbilicus* small, nearly covered.

Diameter, 7·5–8 mm.; height, 7·5 mm.

Dentition unknown.

Jaws present.

Type in the Dominion Museum, Wellington.

Hab.—Chatham Islands (type); Hauraki Gulf to Cook Strait, not common.

3. Gibbula micans, Suter, 1897. Plate 33, fig. 9.

Gibbula micans, Suter, P. Mal. S., ii, 279, fig. in text.

Shell very small, subperforate or imperforate, conical, slightly iridescent, shining. *Sculpture* consisting of fine spiral liræ, about 15 on the penultimate whorl, growth-lines inconspicuous. *Colour* light yellow with radiate oblique broad streaks of dark brown, the intervals with a few light-brown dots; base tessellated with yellowish and brown. *Epidermis* very thin, the pearly inner layer shining partly through it. *Spire* conic, its height greater than that of the aperture, sides very slightly convex. *Protoconch* small, acute, of 2 convex, light-brown, and finely spirally striate whorls. *Whorls* 6, flatly convex, the last keeled at the periphery; base convex. *Suture* very little impressed. *Aperture* slightly oblique, subquadrangular; interior silvery and finely lirate. *Outer* and *basal lip* sharp, angled where they meet, margined with a white band. *Columella* subvertical, slightly arched, with a slight swelling in the middle. *Umbilicus* partly or completely covered by the columella expansion; umbilical tract slightly impressed, white.

Diameter, 3·5 mm. ; height, 4 mm.
Dentition unknown.
Type in my collection.
Hab.—Near Resolution Island (A. Hamilton) ; Blind Bay, Nelson.

4. **Gibbula scamnata,** Fischer, 1878. Plate 38, fig. 23.

Trochus (*Gibbula*) *scamnatus*, Fisch., J. de Conch., 1878, 66. *Gibbula scamnata*, Fisch., Man. Conch. (1), xi, 220, pl. 30, f. 6 ; Suter, P. Mal. S., ii, 278.

Shell small, subperforate, conoidal, solid, dull, spirally lirate. *Sculpture* consisting of elevated spiral liræ, 5 to 6 on the penultimate whorl, 5 to 8 on the base, crossed by very distinct oblique growth-striæ, sometimes cutting up the liræ into small nodules. *Colour* cinereo-olivaceous, with the ribs darker, or quite black. *Spire* conoidal, outline convex, apex acute. *Protoconch* convex, consisting of $2\frac{1}{2}$ whorls, first smooth, then spirally lirate. *Whorls* 5, rapidly increasing, flatly convex, the last subangulate at the periphery ; base flatly convex. *Suture* linear. *Aperture* subrhomboidal, iridescent and lirate within. *Outer lip* sharp and slightly crenulate, edged by a broad white and sulcate callus. *Columella* subvertical, arcuate, a little reflexed, and almost covering the small umbilicus.

Diameter, 7·5 mm. ; height, 7 mm. (type).
Dentition unknown.
Type in the Mus. Hist. Nat., Paris ?
Hab.—Oceanica (Fischer) ; Blind Bay, Nelson ; Te Onepoto, near Lyttelton ; Brighton, Otago.
Remarks.—The species closely resembles *C. rufozona*, A. Ad., from which it may be distinguished by its partly open umbilicus, its arcuate columella without the indication of a tooth, its larger size, and darker colour.

5. **Gibbula Suteri,** E. A. Smith, 1894. Plate 33, fig. 10.

Photinula Suteri, E. A. Smith, P. Mal. S., i, 58, pl. 7, f. 3. *Gibbula Suteri*, Suter, P. Mal. S., ii, 278.

Shell small, turbinate, imperforate, rather thin, slightly shining. *Sculpture* consisting of numerous very fine spiral liræ, more distinct on the base, crossed by fine growth-lines. *Colour* uniformly black or grey, cinereous, pink, &c., longitudinally variegated and tessellated with white ; very often the colour-markings are very much like those of *P. nitida*. *Epidermis* thin, slightly polished. *Spire* conical, sides slightly convex, apex acute, lower than the height of the aperture. *Protoconch* very small, of a few smooth whorls, mostly eroded or covered with Nulliporites. *Whorls* 5, convex, rapidly increasing, the last angled at the periphery ; base slightly convex. *Suture* linear. *Aperture* oblique, rounded, highly bluish iridescent and finely lirate within. *Outer lip* sharp, edged by a silvery narrow and sulcate

callosity. *Columella* vertical, arcuate, its expansion completely covering the umbilicus, leaving only a slight pit. *Umbilical tract* white, impressed.

Diameter, 4 mm.; height, 4 mm. (type). Diameter, 7 mm.; height, 6 mm. (my largest specimen).

Dentition.—Suter, P. Mal. S., ii, 278, fig. in text.

Type in the British Museum.

Hab.—Lyttelton, on seaweeds in tidal rock-pools, type (H. S.); Te Onepoto, near Lyttelton; Akaroa Harbour (H. S.); Lyall Bay.

Genus 2. Fossarina, Adams and Angas, 1863.

Fossarina, Ad. & Ang., P.Z.S., 1863, 423, pl. 37, f. 9, 10. Type: *F. patula*, Ad. & Ang. *Minos*, Hutton, P.L.S. N.S.W., ix, 1884, 369.

Shell auriform, depressed, narrowly umbilicated; spire short; aperture oval, large, and oblique; interior porcellanous, somewhat iridescent; peristome continuous; operculum horny, multispiral, closing the aperture completely.

The dentition resembles that of *Cantharidus*. The teeth of the type are figured by Kesteven in Rec. A.M., iv, No. 7, 318, f. 28*a* in text.

Distribution.—Australasia.

1. **Fossarina rimata**, Hutton, 1884. Plate 33, fig. 11.

Minos rimata, Hutt., P.L.S. N.S.W., ix, 369. *Adeorbis* (?) *Petterdi*, Brazier (*Fossarina*): Hutton, T.N.Z.I., xv. 1882 (1883), 132, not of Brazier. *Fossarina rimata*, Hutt., Index, 83.

Shell small, depressed, auriform, subperforate, thin, slightly shining. *Sculpture* consisting of fine microscopical spiral striæ, crossed by delicate oblique growth-lines. *Colour* reddish-brown, the last whorl with a white band around the periphery and 1 or 2 on the base, white zigzag bands or irregular spots above. *Epidermis* very thin. *Spire* low, conoidal, outline convex. *Protoconch* very small, obtuse, of $1\frac{1}{2}$ smooth convex whorls. *Whorls* 3, very rapidly increasing, convex, the last broadly expanded; base convex. *Suture* well impressed. *Aperture* oblique, very large, broader than high, oval, with a shining but faintly iridescent interior, the colour-markings of the outside distinctly visible. *Peristome* continuous, outer and basal lip edged by a thin white callus. *Columella* oblique, arcuate, white. *Inner lip* covering half of the narrow umbilicus, spreading as a thick, broad callosity over the narrow parietal wall, completely uniting the extremities of the peristome.

Diameter, 5 mm.; height, 4 mm.

Dentition rhipidoglossal.

Type in the Canterbury Museum, Christchurch.

Hab.—Waiwera, type (T. F. Cheeseman); Omaha and Matakana (C. Mathews); Maloney's Reef (H. S.).

Genus 3. Monilea, Swainson, 1840.

Monilea, Swainson, "Shells and Shell-fish," 1840, 352. Type: *Trochus calliferus*, Lam. *Monilea*, Swainson, Man. Conch. (1), xi, 12, 246. *Talopia*, Gray, 1842.

Shell solid or thin, depressed conical, sharply striate and spirally lirate, umbilicated, having a more or less developed callous ridge or funicle revolving on the inner side of the whorl within the umbilicus, and terminating at the columella, the edge of which is reflexed over it. Outer lip sharp, lirate within. Columella sinuous, more or less crenulate on its edge, terminating in a point or denticle at the base.

The Indian Ocean is the habitat of most of the forms, but some are found in the Pacific.

Key to Species.

A. Spiral liræ numerous, fine; margin of umbilicus not crenulate; colour crimson .. .. *carmesina.*
B. Spiral liræ few, sharply elevated; margin of umbilicus crenulate; colour whitish, with brown streaks .. .. .. *egena.*

1. Monilea carmesina, Webster, 1908. Plate 38, fig. 24.

Trochus carmesinus, Webster, T.N.Z.I., xl, 1907 (1908), 256, pl. 20, f. 16–18.

Shell small, depressed trochiform, umbilicated, crimson, spirally striated, shining, rather solid. *Sculpture* of the post-embryonic whorls consisting of fine somewhat unequal spiral striæ, with linear interspaces, about 20 on the upper surface of the body-whorl, and a similar number on the base; a narrow smooth band round the peripheral angle; umbilicus margined by a broadly rounded funicle. *Colour* pale pink, with radiate crimson streaks on the second and third whorls, the succeeding whorls are crimson with occasional lighter streaks, periphery of body-whorl with semicircular small white spots, usually 2 together, and at subequal distances; aperture iridescent within; umbilicus and columella white. *Spire* broadly conical, about 1½ times the height of the aperture; outlines lightly convex. *Protoconch* of 1½ smooth whorls, small and flattish. *Whorls* 5, first slowly, then more rapidly increasing, the upper half convex, the lower slightly concave; periphery of body-whorl roundly angled; base almost flat. *Suture* superficial. *Aperture* oblique, subrhomboidal. *Outer lip* descending, very lightly convex, and forming an acute angle with the faintly arched basal lip; both strengthened inside by a thin callus. *Columella* oblique, straight, with a distinct tubercle above, and a small denticle at the base. *Umbilicus* moderate, deep, extending to the initial whorl, about one-sixth of the greatest diameter, the descending cord distinctly visible. *Operculum* unknown.

Diameter—Maj., 8 mm.; min., 6·25 mm.: height, 5 mm.

Animal unknown.

Type in Mr. Webster's collection.

Hab.—Russell; Cape Palliser, found in shell-sand.

2. **Monilea egena**, Gould, 1849. Plate 38, fig. 25.

Solarium egenum, Gould, Proc. Bost. Soc. N.H., iii, 84; U.S. Expl. Ex., 196, f. 226. *Monilea egena*, Gould, Man. Conch. (1), xi, 253, pl. 37, f. 13; Suter, P. Mal. S., ii, 279. *Monilea zealandica*, Hutt., C.M.M., 40. *Margarita zelandica*, Hutt.: Sow., Conch. Icon., f. 17. *Torinia egena*, Gould: Marshall, in Man. Conch. (1), ix, 22, pl. 6, f. 22, 22.

Shell small, low ovate-conic, thin, amply umbilicated. *Sculpture* consisting of 4 sharply compressed well-elevated spiral ribs on the last, 3 on the penultimate whorl, the two uppermost of which are beaded; interspaces concave, smooth except for fine growth-lines; base with fine broad liræ, 2 elevated cinguli encircling the umbilicus, the inner of them crenulate. *Colour* ashy-white, slightly iridescent, with light-brown radiating streaks, forming zigzag lines on the last whorl; base white, with a brown band outside the 2 umbilical cinguli. *Epidermis* very thin, slightly shining. *Spire* globosely conical, apex blunt, about the same height as the aperture. *Apex* small, depressed convex, reddish-brown, of 2 smooth whorls. *Whorls* 6, convex, the last obtusely angled at the periphery; base convex. *Suture* inconspicuous. *Aperture* subcircular, oblique, iridescent and lirate within. *Outer lip* sharp, edged by a thin iridescent callosity. *Columella* slightly oblique, broadly expanded above, terminating in a small point at the base; edge crenulate below. *Umbilicus* wide, one-third of the diameter of the base, tunnel-shaped, penetrating to the apex, with a few spiral sulci, crossed by longitudinal grooves; the spiral volutions of the funicle distinctly visible.

Diameter, 7·5 mm.; height, 5·5 mm. (type).

Dentition unknown.

Type in the U.S. Nat. Museum, Washington.

Hab.—Bay of Islands; Hauraki Gulf, in sandy places below low-water mark (T. F. Cheeseman); Lyall Bay; Stewart Island, in 18 fathoms (Captain Bollons); Chatham Islands. Nowhere common.

Fossil in the Pliocene.

Subgen. 1. Minolia, A. Adams, 1860.

Minolia, A. Ad., A.M.N.H., iv, 1860, 336. Type: *Minolia punctata*, A. Ad. *Minolia*, A. Ad., Man. Conch. (1), xi, 13, 259. *Solariella*, H. and A. Adams, G.R.M., i, 431; Watson, Chall. Rep., xv, 72, not of S. Wood. *Minosia*, Dunker, Ind. Moll. Mar. Jap., 142.

Shell widely umbilicated, delicate, thin, smooth; whorls rounded; spire depressed; aperture circular; the outer lip and columella thin, simple, acute; umbilicus without an inner funicle or rib.

The species belong to the Indian Ocean and western and south-western Pacific.

KEY TO SPECIES.

A. Shell elevated, conoidal. All spiral liræ crossed by strong radiate riblets, strongly beaded .. .. .. *textilis.*
B. Shell depressed, turbinate or orbicular.
a. Penultimate whorl with 4, the last with about 10 spiral cords *plicatula.*
aa. Penultimate whorl with 6, the last with about 16 spiral cords .. .. *semireticulata.*

3. **Monilea plicatula,** Murdoch and Suter, 1906. Plate 33, fig. 12.

Minolia plicatula, M. & S., T.N.Z.I., xxxviii, 1905 (1906), 299, pl. 26, f. 47–49.

Shell small, orbicular, widely umbilicate, thin and fragile, whitish with radiate purplish streaks, longitudinally plicate above, and spirally ribbed. *Sculpture:* There are rather distant oblique radiate plications extending on the body-whorl to the periphery only; these, as well as the interspaces, are very finely longitudinally striate. On approaching the umbilicus equidistant straight broad and flat riblets are formed, slightly beading the revolving cords. The penultimate whorl has 2 spiral ridges close together, flatly beaded by the radiate plications, and 2 some distance down toward the suture. On the last whorl are 2 spiral cords, somewhat removed from the suture, followed by a smooth interstice and 3 spiral ridges with grooves of their own width between them; 5 narrower cords follow from the periphery to the umbilicus, the grooves between which are first narrow, then getting broader; there is a double beaded ridge margining the umbilicus. *Colour* whitish, with irregular radiate zigzag bands of purple. *Spire* low, with a blunt apex. *Protoconch* smooth, rather large, depressed globular, yellowish, of 1 whorl. *Whorls* $3\frac{1}{2}$, shouldered, convex at the periphery; base flatly convex. *Suture* subcanaliculate. *Aperture* subcircular, very little excavated above, the margins approaching and nearly meeting, slightly nacreous within. *Outer lip* sharp, convex. *Inner lip* forming a very thin layer over the penultimate whorl. *Columella* regularly arched, slightly reflexed, produced at the base on joining the carina of the umbilicus. The latter is wide, carinate, perspective, with spiral ridges and longitudinal plications on the last whorl.

Diameter—Maj., 4·5 mm.; min., 3·8 mm.: height, 3 mm.

Type in the Dominion Museum, Wellington.

Hab.—Off Cuvier Island, in 37 fathoms, type (Captain Bollons); off Great Barrier Island, in 110 fathoms.

4. **Monilea semireticulata,** Suter, 1908. Plate 33, fig. 13.

Minolia semireticulata, Suter, P. Mal. S., viii, 22, pl. 2, f. 1.

Shell small, depressed turbinate, umbilicate, thin and fragile, spirally lirate. *Sculpture* consisting of numerous slightly elevated and rounded spiral cinguli, 6 on the penultimate, about 16 on the body whorl, those on the upper surface with a fine spiral thread in the interstices, which are of about the same width as the riblets; the cinguli on the outer side of the base are finer and closer together; on the

inner side 3 broad slightly crenulated ribs surround the umbilicus, which is also prominently spirally ribbed. The 2 cinguli below the suture are crossed and beaded by strong and sharp equidistant radiate riblets, dividing the interstices into regular squares; the remainder of the whorls with fine growth-lines. *Colour* whitish, light horny. *Spire* low, with convex outlines, very little higher than the aperture, apex rather blunt. *Protoconch* small, globular, of 1 smooth and convex whorl. *Whorls* 4, rather rapidly increasing, somewhat flattened below the suture, then convex; base convex. *Suture* subcanaliculate. *Aperture* circular, slightly iridescent within. *Peristome* sharp, the ends approaching and nearly meeting, united by a white parietal callosity. *Columella* vertical, arcuate, slightly expanded. *Umbilicus* about one-third of the diameter, deep and scalar.

Diameter—Maj., 5 mm.; min., 4 mm.: height, 3·2 mm.

Type in my collection.

Hab.—Near the Snares, in 50 fathoms, empty shells only (Captain Bollons).

5. **Monilea textilis,** Murdoch and Suter, 1906. Plate 33, figs. 14, 14*a*.

Minolia textilis, M. & S., T.N.Z.I., xxxviii, 1905 (1906), 298, pl. 26, f. 45, 46.

Shell small, conoidal, widely umbilicate, fragile, exquisitely sculptured. *Sculpture:* There are numerous radiate sharp riblets at regular intervals, the interspaces about twice the breadth of the costæ, crossing over broad rounded spiral cords; on the third whorl there are 3 spirals, which are supplemented on the following whorl by a faint thread below the suture, and 1 between the first and second cords; on the last whorl there are 2 rather unconspicuous threads below the suture, followed to the periphery by 5 strong spiral cords, the last 3 more prominent than the others; on the base there are 5 narrow equal and close-set spiral riblets, and the umbilicus is margined by a stout beaded ridge; all the spiral cords are strongly and sharply beaded by the longitudinal sculpture. *Colour* greyish-white. *Spire* conoidal, apex rounded. *Protoconch* globular, small, smooth, of 1 whorl; the succeeding volutions show already distinct radiate riblets and spiral threads. *Whorls* 4½, tabulate above, flatly convex below the angulation of the shoulder; base slightly convex. *Suture* canaliculate. *Aperture* subcircular, angled above, white, not nacreous inside. *Outer lip* sharp, convex, margined by denticles on the outside, produced by the spiral ridges. *Inner lip* spread as a thin callosity over the penultimate whorl, and connecting the margins; columella sharp, arched. *Umbilicus* wide, scalar, margined by a strong beaded cord followed by 2 spiral ridges, beaded by longitudinal riblets.

Diameter—Max., 4·3 mm.; min., 3·5 mm.: height, 3·8 mm.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms.

Remark.—The shell used for description (and the figures) is no doubt not adult, as was evidenced by fragments of a larger shell of the same species.

Genus 4. Calliostoma, Swainson, 1840.

Calliostoma, Swainson, "Shells and Shell-fish," 1840, 351. Type: *Trochus zizyphinus*, L. *Calliostoma*, Swainson, Man. Conch. (1), xi, 14, 332. *Zizyphinus*, Gray, Syn. Brit. Mus., 1840 (no description). *Conulus*, Nardo, 1840; not of Fitzinger, 1833. *Lischkeia*, Fischer, Coq. Viv., Trochus, 1880, 419. *Eucasta*, Dall, "Blake" Gastrop., 1889, 369. *Jujubinus*, Monterosato, Nom. Gen. e Spec., 1884, 46. *Jacinthinus*, Monts., Bull. Soc. Mal. Ital., xiv, 1889, 79. *Manotrochus*, Fischer, Manuel, 827.

Animal having the epipodial lobes large, with 3 or 4 pairs of cirri; frontal lobes small, simple or fringed; muzzle rather large, fringed at its extremity; tentacles long, ciliiform; ocular peduncles distinct, but short; foot large, truncated in front; the radula has the central and 4 to 5 lateral teeth with irregularly oval body, and rather long pointed cusps, their outer edges serrate; marginals numerous, narrow, with narrow serrate cusps.

Shell imperforate or rarely umbilicate, conical, rather thin; whorls smooth, spirally ridged or granular, the last angulated at the periphery; aperture quadrangular; columella simple, usually ending in a slight tooth at the base. The operculum is thin, circular, corneous, many-whorled.

The genus is found living in all seas.

Fossil in the Secondary and Tertiary.

Key to Species.

A. Shell small, height less than 10 mm., colour purplish-rose .. *aucklandicum.*
B. Shell large, colour yellowish or brownish.
  a. Last whorl rounded at periphery, not angular .. *punctulatum.*
  aa. Last whorl sharply angled at periphery .. .. *selectum.*
  aaa. Last whorl subangular at periphery.
    b. With finely beaded spiral liræ.
      c. 16–20 spiral liræ on the penultimate whorl .. *tigris.*
      cc. 8–12 spiral liræ on the penultimate whorl .. *pellucidum.*
    bb. Spiral ribs coarsely granose, distant, 7–8 on the penultimate whorl .. .. *spectabile.*

1. Calliostoma aucklandicum, E. A. Smith, 1902. Plate 33, fig. 15.

Calliostoma aucklandicum, E. A. Smith, Report on the Collections of Nat. Hist., Voy. "Southern Cross," Moll., 1902, 207, pl. 24, f. 5.

Shell small, conical, umbilicus covered, purplish, spirally lirate. *Sculpture* consisting of spiral threads, which increase in number upon the whorls with the growth of the shell; there are 8 liræ on the penultimate whorl, the uppermost, or that just below the suture, somewhat nodose or subplicate; body-whorl with 8 liræ above the angle, 10 to 11 upon the base. *Colour* purplish-rose; under the lens the narrow sulci between the spiral threads are seen to be of a dirty-whitish colour. *Spire* conical, much higher than the aperture, outlines straight. *Proto-*

coneh small, of 1 whorl, which is smooth, pale or yellowish. *Whorls* 6, very slightly convex, the last angular at the periphery; base flat, excavated and white in the centre. *Suture* not much impressed. *Aperture* subquadrate, pearly and smooth inside. *Outer* and *basal lip* acute, edged with rose, inside slightly callous. *Columella* suboblique, white, slightly reflexed above, subdentate below. *Opereulum* thin, horny, multispiral.

Diameter—Maj., 8 mm.; min., 7 mm.: height, 7·5 mm.

Type in the British Museum.

Hab.—Auckland Islands, in 10 fathoms.

I have not seen this species.

2. **Calliostoma pellucidum,** Valenciennes, 1846. Plate 40, fig. 3.

Trochus pellucidus, Val., Voy. "Venus," Moll., pl. 4, f. 2. *Calliostoma pellucidum*, Val., Man. Conch. (1), xi, 334, pl. 65, f. 78; x, pl. 41, f. 36: Suter, P. Mal. S., ii, 281. *Zizyphinus granatus*, Chemp.: Reeve, Conch. Icon., f. 2; not *Trochus granatum*, Chemn.

Shell conical, imperforate, solid, whitish dotted with brown, last whorl subangular. *Sculpture* consisting of numerous closely beaded lirae, 8 to 12 on the penultimate whorl, and the same number on the last whorl above the periphery, with a few smooth fine lirae intercalated; just at or just below the periphery there is a group of lirulae, closer, smaller than those of the upper surface; the rest of the base is more or less regularly granose-lirate. *Colour* yellowish, with a few brown oblique longitudinal streaks; large squarish brown spots above the suture, and just above the periphery are usually present; the spiral lirae are closely and minutely dotted with brown and white. *Epidermis* thin, faintly shining. *Spire* conical, higher than the aperture, very acute, outlines concave above, slightly convex below. *Protoeoneh* small, sharply pointed, white, the first whorl smooth, the second granulose. *Whorls* 9 to 10, first slowly, then more rapidly increasing, flat, the last subangular at the periphery; base flatly convex. *Suture* very slightly impressed. *Aperture* oblique, rhomboidal, iridescent and lirate within. *Outer lip* sharp, very slightly crenulate, edged by a broad white callosity. *Columella* arcuate, greyish-white, shining, with a slight tubercle at the base. *Inner lip* forming a narrow white callosity on the outside of the columella. There is a slight umbilical depression, bounded by a strong rib.

Diameter, 30 mm.; height, 30 mm.

Type in the Mus. Hist. Nat., Paris ?

Hab.—North Island—Cape Maria van Diemen, Whangarei, Hauraki Gulf, from low-water mark to 25 fathoms; Cook Strait; Kermadec Islands. Often found attached to floating seaweeds.

Fossil in the Miocene and Pliocene.

3. Calliostoma punctulatum, Martyn, 1784. Plate 8, fig. 11.

Trochus punctulatus, Mart., Un. Conch., ii, f. 36, not of 1769. *Calliostoma punctulatum*, Mart., Man. Conch. (1), xi, 334, pl. 65, f. 75; Suter, P. Mal. S., ii, 280. *Trochus diaphanus*, Gmelin, Syst. Nat., ed. xiii, 1790, 3580; Quoy & Gaim., Voy. Astrol., iii, 254, pl. 64, f. 1–5. *Turbo grandineus*, Valenciennes, Voy. "Venus," pl. 4, f. 4. *Zizyphinus punctulatus*, Mart.: Hutton, M.N.Z.M., 98.

Shell conoidal, imperforate, solid, not shining. *Sculpture* consisting of narrow spiral closely and conspicuously beaded ridges, 8 to 12 on the penultimate whorl, sometimes equal in size, sometimes alternately larger and smaller; the interstices with fine crowded growth-lines; the base has the very same sculpture. *Colour* yellowish or light fawn, unicoloured or dotted on the spirals with dark brown; the granules are often white, the epidermis having been rubbed off. *Epidermis* thin, dull. *Spire* conical, outline convex, rarely a little concave toward the apex, about the same height as the aperture, apex acute, minute. *Protoconch* minute, globular, with 1 smooth whorl. *Whorls* 8 to 9, convex, first slowly, then rather rapidly increasing, the last rounded at the periphery; base convex. *Suture* not deep. *Aperture* rhomboidal, oblique, pearly and lirate within. *Outer lip* solid, sharp, sulcate, basal lip sulcate or denticulate within. *Columella* subvertical, arcuate, pearly, not tubercled below. *Inner lip* forming a narrow white callosity over the impressed umbilical tract, ending below in a distinct tooth outside the columella.

Diameter, 36 mm.; height, 36 mm.

Dentition.—Hutton, T.N.Z.I., xiv, 165, pl. 7, f. H.

Jaw.—Rev. A. H. Cooke, "Molluscs," 1895, 212, f. 108*c*.

Hab.—North and South Islands and Stewart Island, at low-water mark and in deeper water, more common in the South; Snares. Brought to England by Captain Cook.

Fossil in the Miocene and Pliocene.

4. Calliostoma selectum, Chemnitz, 1795. Plate 40, fig. 4.

Trochus selectus, Chemn., Conch. Cab., xi, 168, pl. 168, f. 1896–97. *Calliostoma selectum*, Chemn., Man. Conch. (1), xi, 335, pl. 65, f. 73, 74; Suter, P. Mal. S., ii, 281. *Trochus Cunninghami*, Gray: Griffith's "Cuvier's Animal Kingdom," xii, 1834, pl. 1, f. 7. *T. torquatus*, Anton: Philippi, Conch. Cab., 1849, 261, pl. 38, f. 13. *Zizyphinus articulatus*, Reeve, Conch. Icon., f. 3, 1863. *Z. decarinatus*, Perry: Hutton, P.L.S. N.S.W., ix, 1884 (1885), 359, not of Perry.

Shell large, solid, conical, imperforate, whitish, the last whorl sharply angled. *Sculpture:* Upper surface with numerous delicate spiral closely granulose ribs, numbering 10 or 11 on the penultimate whorl, more numerous on the upper surface of the last whorl because interstitial lirulæ are intercalated; on the antepenultimate whorl there are 5 and on earlier whorls 3 granose liræ; on the base there are distinctly granose liræ in the middle, but toward the periphery they become smaller, narrower, and less distinctly grained. *Colour* pale fawn, almost white, with elongated brown dots on the spiral riblets.

Epidermis thin, very little shining. *Spire* conical, its lateral outlines slightly concave on the upper part. *Protoconch* acute, of a few smooth and convex whorls. *Whorls* 8 to 9, flat, the last slightly convex above, sharply angular at the periphery ; base flat, very little convex. *Suture* superficial, not very distinct. *Aperture* subrhomboidal, oblique, pearly and iridescent within, the nacre showing by folds the positions of the principal liræ of the outside. *Outer lip* sharp, slightly crenulated, sharply angled at the junction with the basal lip, which is also crenulate, horizontal and slightly convex. *Columella* arcuate, oblique, slightly pearly. The *inner lip* spreading as a broad white callus over the umbilical tract, sharply bounded by a circular ridge.

Diameter, 47 mm. ; height, 37 mm. Diameter, 57 mm. ; height, 50 mm.

Dentition.—Hutton, T.N.Z.I., xv, 124, pl. 14, f. L.

Type (?).

Hab.—Auckland to Cook Strait, not common. Brought to England by Captain Cook.

Fossil in the Pliocene.

5. **Calliostoma spectabile,** A. Adams, 1855. Plate 40, fig. 5.

Zizyphinus spectabilis, A. Ad., P.Z.S., 1854 (i, 1855), 37, pl. 27, f. 7. *Calliostoma spectabile*, A. Ad., Man. Conch. (1), xi, 332, pl. 16, f. 12 ; Suter, P. Mal. S., ii, 280.

Shell large, conical, solid but rather thin, imperforate, flesh-coloured. *Sculpture* consisting of spiral coarsely granose ribs, 7 to 8 on the penultimate whorl, the 2 lowest of them small ; on the base there are about 8 to 10 concentric ridges, the inner 2 or 3 of them only are distinctly beaded. *Colour* flesh or yellowish, dotted with reddish-brown on the spiral ribs, more distinct upon the base. *Epidermis* very thin, not shining. *Spire* conical, much broader than usual in the genus. *Protoconch* small, pointed, consisting of 2 whorls, the first smooth, the second with 2 spiral and distant radiate riblets. *Whorls* 8 to 9, slightly convex, the last obtusely angled at the periphery ; base flatly convex. *Suture* slightly impressed. *Aperture* rounded quadrangular, nacreous and reddish iridescent within, broadly and strongly sulcate. *Outer* and *basal lip* sharp, slightly crenulate, edged within by a thin callosity. *Columella* arcuate, slightly pearly. *Inner lip* forming a narrow white callosity, spreading from the umbilical tract to the base of the columella.

Diameter, 42 mm. ; height, 43 mm. Diameter, 37 mm. ; height, 35 mm.

Type in the British Museum.

Hab.—Auckland Islands (Dr. H. Krone, Captain Bollons) ; Chatham Islands (*fide* Pilsbry) ; Foveaux Strait, in 18 fathoms (Captain Bollons).

A rare shell in collections.

Fossil in the Miocene.

6. **Calliostoma tigris**, Martyn, 1784. Plate 40, fig. 6.

Trochus tigris, Mart., Un. Conch., ii, f. 75. *Calliostoma tigris*, Mart., Man. Conch. (1), xi, 333; x, pl. 41, f. 30: Suter, P. Mal. S., ii, 280. *Trochus granatum*, Lam., A.s.V., ix, 145. *Zizyphinus granatum*, Chemnitz: Hutton, M.N.Z.M., 98, not of Chemnitz.

Shell large, conical, imperforate, solid but rather thin, shining. *Sculpture* consisting of numerous delicate finely beaded lirulæ, 16–20 on the penultimate whorl, 18–25 on the upper surface of the body-whorl; the whole of the base similarly sculptured. *Colour* light-yellowish, longitudinally painted with numerous rather narrow irregular chestnut-reddish stripes. *Spire* elevated, acute, concave above, slightly convex below, very little higher than the aperture. *Protoconch* very small, pointed, finely decussate, but mostly worn smooth. *Whorls* 10–12, the first 6 distinctly shouldered and slowly increasing, the following whorls flatly convex, rapidly increasing, the last whorl large, angularly rounded at the periphery; base convex. *Suture* inconspicuous on the earlier, impressed on the later whorls. *Aperture* rhomboidal, slightly oblique, iridescent and lirate within. *Outer lip* sharply rounded on meeting the broadly convex lower lip, sharp, strengthened within by a thick and broad pearly layer. *Columella* arcuate, oblique, pearly, bluntly tuberculate at base. *Inner lip* spreading very little beyond the columella; a very thin transparent glaze spreading over the parietal wall.

Diameter, 45–58 mm.; height, 45–59 mm.

Dentition unknown.

Hab.—Bay of Islands to Cook Strait; Chatham Islands. Brought to England by Captain Cook.

Remark.—This is a rather rare shell, living apparently below low-water mark.

Genus 5. Euchelus, Philippi, 1847.

Euchelus, Phil., Zeitschr. für Malac., 1847, 20. Type: *Monodonta tricarinata*, Lam. = *E. quadricarinatus*, Chemn. *Euchelus*, Phil.: Fischer, Man. de Conch., 827; Man. Conch. (1), xi, 15, 429. *Aradasia*, Gray, Fig. of Moll. Anim., iv, 1850, 90. *Huttonia*, T. W. Kirk, T.N.Z.I., xiv, 1882, 282. *Monodonta* and *Trochus* (in part) of authors.

Animal with 4 pairs of cirri on the epipodial line, besides a number of long and thin filaments. The radula has a narrow central and 5 lateral teeth; jaws are present.

Shell globose-turbinate, umbilicate or imperforate; whorls rounded spirally granose-lirate; aperture subcircular; outer lip thick, crenulate within; columella with a tooth or a notch at the base; operculum with few whorls.

Distribution.—Indian and Pacific Oceans.

KEY TO SPECIES.

A. Shell imperforate when adult .. .. *bellus.*
B. Shell distinctly perforate when adult .. .. .. *Hamiltoni.*

1. Euchelus bellus, Hutton, 1873. Plate 38, fig. 26.

Euchelus bellus, Hutt., C.M.M., 37; Man. Conch. (1), xi, 435, pl. 67, f. 80; Suter, P. Mal. S., ii, 282. *Huttonia tricolor*, T. W. Kirk, T.N.Z.I., xiv, 1881 (1882), 282.

Shell small, globose-conic, solid, thick, imperforate when adult. *Sculpture* consisting of spiral granose liræ, the interstices narrow; there are 7 or 8 equal liræ on the penultimate whorl, 10 on the body-whorl. *Colour* brownish or bluish-black; "dead shells" are pink, varied with darker. *Spire* short, conic, very little higher than the aperture; outlines convex. *Protoconch* small, depressed, of $1\frac{1}{2}$ whorls, the first whorl smooth, the following half with 2 granose keels. *Whorls* 5, convex, the last globose, descending in front; base convex. *Suture* canaliculate. *Aperture* rounded, lirate inside and nacreous with steel-blue and dark-red reflections. *Outer lip* convex, thick, denticulate, with a strongly wrinkled callosity inside. *Columella* concave, terminating in a tooth, below which there is a narrow notch, and another tubercle or tooth on the basal lip equal in size to the columellar denticle; very often there is a second notch, followed by a smaller tubercle. There is a groove at the place of the umbilicus.

Diameter, 6·5 mm.; height, 6·5 mm.

Dentition unknown.

Type in the Dominion Museum, Wellington.

Hab.—Chatham Islands (type); Bay of Islands to Cook Strait, under stones near low-water mark.

Remarks.—This shell is mostly covered by a scarlet-coloured sponge. There is nothing to separate Kirk's species from *E. bellus*. Hutton founded the species on "dead shells" from the Chathams, in which the nacre of the aperture had been lost. I have compared the types of the two species, and there is absolutely nothing to separate them.

2. Euchelus Hamiltoni, T. W. Kirk, 1882.

Huttonia Hamiltoni, T. W. Kirk, T.N.Z.I., xiv, 1881 (1882), 283. *Euchelus Hamiltoni*, T. W. Kirk, Man. Conch. (1), xi, 436; Suter, P. Mal. S., ii, 282.

Shell small, globose, solid, perforate. *Sculpture* consisting of fine spiral granose liræ, with the interstices of the same width, 8 liræ on the penultimate whorl, about 18 on the last. *Colour* of the beach-worn specimens white, or faint pinkish-white, with points of darker colour forming diagonal lines across the whorls. *Spire* short, conical, nearly the same height as the aperture, outlines convex. *Protoconch* depressed globose, of $1\frac{3}{4}$ whorls, the first smooth. *Whorls* $3\frac{1}{2}$, rapidly increasing, convex, the last descending in front; base convex. *Suture* canaliculate.

Aperture rounded. *Outer lip* thick, toothed within. *Columella* subvertical, straight, with a tubercle at its base, followed by 2 notches and 2 or 3 teeth on the basal lip. *Umbilicus* narrow but deep, the basal lip continued as a rib and descending into the umbilicus. *Operculum* unknown.

Diameter, 6 mm. ; height, 6 mm.

Dentition unknown.

Type in the Dominion Museum, Wellington.

Hab.—Wellington.

Remarks.—Pilsbry remarks : "May prove the same as *E. tasmanicus*, T.-Woods." Tate and May make the latter a synonym of *E. scabriusculus*, Angas, which is the type of section *Herpetopoma*, Pilsbry, having a multispiral operculum. The latter species has usually a much coarser sculpture, the spiral liræ are less numerous, the umbilicus is not so deep and partly covered by the inner lip. As the operculum of *E. Hamiltoni* is unknown, it is impossible to say whether the two species are really so nearly allied as the shell-characters would indicate.

Fam. **LIOTIIDÆ**, Gray.

Animal with the head proboscidiform, epipodial line with a pair of conical lobes and 3 pairs of cirri. Dentition similar to that of *Delphinula*, *Turbo*, and *Astræa*, with 5 lateral teeth. Jaws present.

Shell turbiniform or discoidal, white, with longitudinal ribs or clathrate ; aperture feebly nacreous ; peristome continuous, thick, with a callous varix ; operculum multispiral, hispid, corneous, with a calcareous layer formed of pearly particles spirally disposed.

Genus 1. Liotia, Gray, 1847.

Liotia, Gray, Syn. Brit. Mus., 1840 (no description) ; P.Z.S., 1847, 145.
Type : *Delphinula cancellata*, Gray.

Characters those of the family. Gray's type was a cancellated species, and the genus *Liotia*, in the most restricted sense, will comprise those species which have numerous varices or radiating circumambient ribs cancellated more or less by spiral sculpture. (Dall.)

Distribution.—Tropical and subtropical seas.

Fossil.—Lias and Eocene. Not known to occur fossil in New Zealand, but in Australia.

Key to Species.

A. Shell turbinate, with axial riblets .. .. *polypleura.*
B. Shell discoidal.
a. With radial riblets.
b. Riblets strong, the interstices microscopically spirally striate .. .. *rotula.*
bb. Riblets very fine, periphery serrate .. .. *serrata.*
aa. Without radial riblets, a few folds at suture and umbilicus, 2 keels produced into processes at the peristome .. *solitaria.*

1. **Liotia polypleura,** Hedley, 1904. Plate 33, fig. 16.

Liotia polypleura. Hedley, Rec. A.M., v, pt. 2, 1904, 93, f. 20 in text.

Shell minute, thin, turbinate, widely umbilicate, spire slightly elevate. *Sculpture:* On the last whorl about 16 thick prominent riblets cross the whorl, slender on leaving the suture; they slant forward, thickening rapidly, but turning they descend the periphery perpendicularly; on the base they again bend, and, tapering rapidly, curve into the umbilicus, the margin of which they crenulate; the interstices are smooth; on the penultimate whorl the ribs gradually vanish. *Colour* white. *Protoconch* of 1½ smooth whorls. *Whorls* convex, 2½, the last descending in front; base convex. *Suture* deep. *Aperture* subquadrate, almost free, peristome formed by one of the ribs. *Umbilicus* moderately wide, deep.

Diameter—Maj., 0·9 mm.; min., 0·7 mm.: height, 0·6 mm.

Type in the Australian Museum, Sydney.

Hab.—Lyall Bay, near Wellington (A. Hamilton); Banks Peninsula (Iredale); Bounty Island, in 50 fathoms (Captain Bollons).

Remark.—This species appears to be related to such Australian forms as *L. annulata*, Ten.-Woods. (Hedley.)

2. **Liotia rotula,** Suter, 1908. Plate 33, fig. 17.

Liotia rotula, Suter, P. Mal. S., viii, 24, pl. 2, f. 6.

Shell small, discoidal, umbilicate, rather solid, translucent, radiately prominently ribbed. *Sculpture* consisting of distant, elevated, and rounded radiate riblets, much closer together on approaching the aperture. *Interstices* distantly microscopically spirally striate. *Colour* white. *Spire* flat, the apex only slightly raised. *Protoconch* of 2 narrow, smooth, convex whorls. *Whorls* 4, the last large, convex, the last rounded at the periphery; base convex. *Suture* impressed. *Aperture* circular. *Peristome* continuous, thickened by the last radiate rib. *Columella* arcuate, not reflexed. *Umbilicus* wide, perspective, showing all the whorls. *Operculum* not seen.

Diameter, 1·7 mm.; height, 1 mm.

Animal unknown.

Type in my collection.

Hab.—Snares, in 50 fathoms (Captain Bollons).

Remarks.—Allied to *L. annulata*, Ten.-Woods, from Tasmania, which, however, has the radiate riblets more distant, and lacks spiral striation. *L. corona*, Hedley, is also nearly related, but it is much smaller, and the radiate riblets are less elevated.

3. **Liotia serrata,** Suter, 1908. Plate 33, figs. 18, 18*a*.

Liotia serrata, Suter, P. Mal. S., viii, 23, pl. 2, f. 4, 5

Shell small, discoidal, rather solid, umbilicated. *Sculpture* consisting of minute fine and slightly wavy radiate riblets; periphery

of the flat whorls adorned with distant sharp denticles; base on the outside with a spiral carina, with low and rounded tubercles; margin of umbilicus more or less crenulate. *Colour* white. *Spire* flat. *Protoconch* very small, of 1 whorl only, flat. *Whorls* 3½, rapidly increasing, flat above, with a pronounced angle at the periphery, and a rounded carina below; space between them convex; base flat. *Suture* impressed, the serrate processes extending over it. *Aperture* circular, slightly oblique. *Peristome* continuous, with a callous varix. *Columella* arcuate, with an outer tubercle at its base. *Umbilicus* rather large and deep. *Operculum* not seen.

Diameter, 2·5 mm.; height, 1 mm.

Animal unknown.

Type in my collection.

Hab.—Near Little Barrier Island, in 20 fathoms, (R. H. Shakespear).

Remark.—This species is nearly allied to the foregoing, however distinct from it in several characters.

4. **Liotia solitaria,** Suter, 1908. Plate 33, figs. 19, 19*a*.

Liotia solitaria, Suter, P. Mal. S., viii, 23, pl. 2, f. 2, 3.

Shell small, discoidal, solid, umbilicated. *Sculpture:* The flat surface having a peripheral stellate carina, the processes triangular and directed forward; base bordered by a smooth and sharply elevated carina; a few radiate folds outside the suture and around the umbilicus. *Colour* yellowish-pink. *Spire* perfectly plane. *Protoconch* minute, flat, indistinct. *Whorls* 3½, rapidly increasing, flat, the last very little convex above, slightly concave between the 2 keels; base convex inside the carina. *Suture* superficial, slightly margined. *Aperture* circular. *Peristome* continuous, slightly thickened, ornamented with 2 processes produced by the keels. *Columella* arcuate, thick. *Umbilicus* moderately wide, showing the apical whorls. *Operculum* not seen.

Diameter, 2·75 mm.; height, 1 mm.

Animal unknown.

Type in my collection.

Hab.—Near Little Barrier Island, in 20 fathoms (R. H. Shakespear).

Remarks.—The only specimen in my possession is not an adult shell. The species is allied to *L. stellaris*, Ad. & Rve.

Fam. CYCLOSTREMATIDÆ, Fischer.

Animal with ciliated, thread-like tentacles; the eyes on short peduncles; snout bilobed; foot elongated, truncate in front, and extending at each angle into a filament; sides with 3 or 4 pairs of ciliated cirri, and a pair of auricular appendages in front, between the cirri and the tentacles. Jaw scaly. Dentition $\infty + 4 + 1 + 4 \infty$.

Shell small, umbilicated, depressed, white, corneous or transparent, not nacreous; aperture circular, with continuous sharp peristome; operculum corneous, multispiral.

KEY TO GENERA.

A. Shell depressed, spiral and radial sculpture prominent, umbilicus wide, bounded by a carina .. .. .. CYCLOSTREMA.
B. Shell depressed, sculpture rather inconspicuous, umbilicus wide, without a carina .. .. DELPHINOIDEA.
C. Shell turbinate, narrowly umbilicate, peristome continuous, double .. .. CIRSONELLA.
D. Shell globose, thick, porcellanous, sub- or im-perforate, peristome thickened .. .. PSEUDOLIOTIA.

Genus 1. CYCLOSTREMA, Marryatt, 1818.

Cyclostrema, Marryatt, Trans. Linn. Soc., xii, 1818, 338. Type: *C. cancellata*, Marryatt. *Cyclostrema*, Marryatt, Man. Conch. (1), x, 14, 88.

Shell depressed, suborbicular, distinctly spirally and radially sculptured, white or uniformly coloured; aperture nearly circular; peristome acute, continuous; umbilicus deep, bounded by a carina; operculum circular, horny, multispiral, each volution obliquely striated.

Distribution.—Nearly universal.

Fossil.—Tertiary.

1. Cyclostrema eumorpha, Suter, 1908. Plate 33, figs. 20, *a*, *b*.

Cyclostrema eumorpha, Suter, P. Mal. S., viii, 25, pl. 2, f. 7–9.

Shell very small, turbinate, umbilicate, translucent, white, spirally distantly ribbed, and radiately striate. *Sculpture* consisting of 5 prominent spiral riblets, the first just above the periphery; a low and indistinct spiral riblet on the last whorl outside the suture, and sometimes a fine riblet bordering the funnel-shaped umbilicus; radiate sculpture formed by distinct threads, which are equidistant, slightly directed backward, the interstices wider than the threads. *Colour* white. *Spire* depressed conoidal, lower than the aperture. *Protoconch* minute, sphærical, of 1 whorl only. *Whorls* 3, regularly increasing, convex, the last flattened between the suture and the first spiral riblet, periphery rounded; base convex. *Suture* impressed. *Aperture* oblique, circular. *Peristome* continuous, smooth inside, ornamented outside by the spiral sculpture. *Columella* arcuate, strong, not reflexed. *Umbilicus* rather narrow, deep. *Operculum* not seen.

Diameter—Maj., 1·7 mm.; min., 1·4 mm.: height, 1·3 mm.

Animal unknown.

Type in my collection.

Hab.—Snares, in 50 fathoms (Captain Bollons).

Remark.—This species is allied to the South Australian *C. delectabile*, Tate, in which, however, the spiral riblets are more numerous and less prominent; the umbilicus is much wider, perspective.

Genus 2. Delphinoidea, Brown, 1827.

Delphinoidea, Brown, Illustr. Conch. Gr. Brit., 1827, pl. 51. Type: *D. serpuloides* (Montagu). *Delphinoidea*, Brown: Katherine J. Bush, Trans. Connecticut Acad., x, 1897, 100.

Shell small, white, consisting of a few convex whorls coiled nearly in the same plane, so that the spire is but little raised; suture deep; umbilicus rather large, deep, with rounded walls, showing all the whorls, and not defined by a carina; aperture oblique, nearly circular, slightly angulated above, not modified by the body-whorl; peritreme simple, thin, entire, but slightly attached; columellar edge very slightly or not at all flattened.

Distribution.—Similar to that of *Cyclostrema*. The type is from Devonshire coast, England.

1. **Delphinoidea lissa**, Suter, 1908. Plate 34, figs. 1, 1*a*.

Cyclostrema lissum, Suter, P. Mal. S., viii, 25, pl. 2, f. 10, 11.

Shell minute, discoidal, thin, smooth, umbilicated. *Sculpture:* To the naked eye the shell appears to be quite smooth, but a powerful lens reveals subequidistant, strongly undulating, radiate threads; no spiral sculpture is visible. *Colour* yellowish-white. *Spire* flat, the nucleus only being slightly raised. *Protoconch* of 1 smooth whorl, which is convex, and the first half very often slightly elevated. *Whorls* 2, the last flatly convex above, periphery and base rounded. *Suture* impressed. *Aperture* subcircular, a little angled above. *Peristome* continuous, sharp. *Outer lip* advancing, and producing a distinct notch at the suture. *Columella* arcuate, slightly thickened. *Umbilicus* moderate, open. *Operculum* not seen.

Diameter, 1 mm.; height, 0·6 mm.

Animal unknown.

Type in my collection.

Hab.—Lyttelton Harbour, on seaweeds, type (H. S.); Titahi Bay, Cook Strait (Miss Mestayer).

Remark.—This species is well characterized by its minuteness, the few whorls, and the microscopic radiate sculpture.

Genus 3. Cirsonella, Angas, 1877.

Cirsonella, Angas, P.Z.S., 1877, 38. Type: *C. australis*, Angas. *Cirsonella*, Angas, Man. Conch. (1), x, 16, 107.

Shell minute, globosely turbinate, smooth, narrowly umbilicated; aperture circular; peristome continuous, slightly thickened. (Angas.)

Distribution.—Australasia.

Key to Species.

A. Shell with microscopic fine spiral liræ; perforation partly concealed .. .. *densilirata.*

B. Shell smooth, growth-lines only.

a. Whorls 4; aperture subcircular; perforation open; height, $1\frac{3}{4}$ mm. .. .. *granum.*

aa. Whorls 5; aperture ovate; umbilicus partly concealed; height, $2\frac{3}{4}$ mm. .. .. *neozelanica.*

1. Cirsonella densilirata, Suter, 1908. Plate 34, fig. 2.

Cirsonella densilirata, Suter, P. Mal. S., viii, 26, pl. 2, f. 13.

Shell small, turbinate, subdiaphanous, slightly shining, perforated. *Sculpture* consisting of numerous fine microscopic spiral liræ. *Colour* white. *Spire* depressed conoidal, outlines convex, lower than the aperture. *Protoconch* of 2 convex smooth whorls; yellowish-white. *Whorls* 3½, rapidly increasing, convex, periphery of last whorl rounded, base convex, with an impressed umbilical area. *Suture* not much impressed. *Aperture* circular, oblique, inside microscopically lirate. *Peristome* continuous, thick. *Columella* arcuate, slightly expanded toward the narrow perforation, sometimes partly concealing it. *Operculum* horny, multispiral; nucleus central.

Diameter, 2·25 mm.; height, 1·75 mm.

Animal unknown.

Type in my collection.

Hab.—Snares, in 50 fathoms (type); Bounty Islands, in 50 fathoms (Captain Bollons).

Remark.—The species is very closely related to the Tasmanian *C. Weldii*, Ten.-Woods, which, however, is smooth, having a few spiral liræ around the umbilicus only.

2. Cirsonella granum, Murdoch and Suter, 1906. Plate 34, fig. 3.

Cirsonella granum, M. & S., T.N.Z.I., xxxviii, 1905 (1906), 300, pl. 27, f. 50, 51.

Shell minute, turbinate, umbilicate, smooth and glossy. *Sculpture* absent, except for the microscopic growth-striæ. *Colour* white, fresh specimens vitreous. *Spire* conoidal, small, height a little less than that of the aperture. *Protoconch* consists of 1 whorl, which is smooth and rounded. *Whorls* 4, much rounded, the last proportionately large; base convex. *Suture* deep. *Aperture* subcircular, broadly angled above, but little excavated by the body-whorl. *Outer lip* sharp, forming a half-circle with the basal lip. *Columella* concave and reflected, thickened. *Inner lip* spread as a thin layer upon the parietal wall. *Umbilicus* with its area small and with a somewhat sharply defined margin, the perforation narrow.

Diameter, 1·75 mm.; height, 1·75 mm.

Type in the Dominion Museum, Wellington.

Hab.—About 15 miles outside Great Barrier Island, in 110 fathoms.

Remark.—It is a much smaller shell than *C. neozelanica*, more globular, with the aperture more circular, and better and differently defined umbilical area.

3. Cirsonella neozelanica, Murdoch, 1899. Plate 34, fig. 4.

Cirsonella neozelanica, Murdoch, P. Mal. S., iii, 320, pl. 16, f. 2–6.

Shell small, ovate, perforate, semitransparent. There is no *sculpture*, except microscopical fine close growth-striæ. *Colour* horny-fuscous. *Epidermis* very thin, faintly shining. *Spire* conical, a little

lower than the aperture, outlines convex. *Protoconch* rounded, shining, and quite smooth. *Whorls* 5, the last large and globular, the spire-whorls somewhat rounded ; base convex. *Suture* well marked. *Aperture* ovate, somewhat oblique. *Outer lip* thin and simple. *Columella* arcuate, solid, thickened, and slightly reflected ; a callus extends from the insertion of the outer lip to the columella, partially concealing the narrow umbilicus. *Operculum* horny, consisting of about 2 rapidly increasing whorls.

Diameter, 2·3 mm. ; height, 2·75 mm.

Animal.—Foot comparatively large, flat, and undivided ; tail abruptly rounded ; head produced into a retractile muzzle, emarginate anteriorly ; tentacles of medium length, expanding and uniting at the base so as to conceal the posterior portion of muzzle ; eyes immersed, and situate in the lower half of tentacles ; colour whitish throughout.

Jaws forming 2 irregularly ovate objects, united by a narrow band ; they are dark in colour, and the surface, as it were, imbricate, with scale-like markings.

Dentition. — The formula is 23+2+1+2+23. The teeth are arranged in numerous transverse curved rows, the rhachidian short and broad, with 11 minute cusps ; the laterals elongated, with the apex somewhat expanded and curved inwards, the first armed with 6 or 7, the second with 7 or 8 minute denticles ; marginals about 23, having a single rounded cusp, and becoming shorter as they proceed outwards.

Type in the Wanganui Museum.

Hab.—Inner Harbour, Napier ; found in considerable numbers around the margin of a brackish pool ; type (F. Hutchinson, jun.) : Titahi Bay, Cook Strait.

Genus 4. Pseudoliotia, Tate, 1898.

Pseudoliotia, Tate, T.R.S. S.Aust., xxii, 1898, 71. Type : *Cyclostrema micans*, A. Ad.

Shell somewhat like *Liotia ;* test thick and porcellanous ; aperture oblique to the axis, its margin thickened ; umbilicus reduced to a mere chink ; operculum horny, multispiral.

It recalls *Moelleria*, which is differentiated by a calcareous operculum.

Distribution.—Australia, Tasmania, and New Zealand.

1. Pseudoliotia imperforata, Suter, 1908. Plate 34, fig. 5.

Pseudoliotia imperforata, Suter, P. Mal. S., viii, 26, pl. 2, f. 14.

Shell small, globose, imperforate when adult, thick, spirally costate. *Sculpture* consisting of prominent nodulous ribs, the nodules rather low ; there are 2 ribs on the penultimate and 6 on the last whorl ; on the latter a small nodulous rib appears on the last half of the volution,

close to the suture, followed by 4 equally strong equidistant spiral ribs, the interspaces much broader than the ribs; the whole crossed by fine, close, oblique incremental striæ; a sixth broad rib, more nodulous than the others, forms a half-circle around the strongly impressed umbilical area, which is ornamented with distant axial folds. *Colour* yellowish-white, the spiral ribs maculated with brown. *Spire* depressed, lower than the aperture. *Protoconch* white, of 2 spirally costate flat whorls. *Whorls* 4, the last large, flattened below the suture, then convex; base rounded. *Suture* not impressed. *Aperture* oblique, nearly circular, white and porcellanous inside. *Peristome* thick, very little contracted, crenulated on the outside by the spiral ribs, regularly convex. *Columella* arcuate, shining white, thick. *Inner lip* spreading over the umbilicus, completely sealing it up, or sometimes leaving a minute chink; a white callus unites the converging margins of the peristome. In young specimens the *umbilicus* is open, but very narrow. *Operculum* not seen.

Diameter, 3·5 mm.; height, 3·5 mm.

Animal unknown.

Type in my collection.

Hab.—Stewart Island.

Remark.—The species is distinguished from the type, *P. micans*, by the absence of radiate riblets, the discontinuous peristome, and the closed umbilicus.

Fam. **VITRINELLIDÆ**, K. J. Bush.

Cyclostrematidæ, auth., in part. *Adeorbidæ*, Dall., in part.

Shell small, more or less hyaline, spire varying from concave to moderately elevated; umbilicus deep, narrow to wide; aperture nearly circular; peristome simple, more or less continuous; columellar lip often flattened and angular below; operculum horny, multispiral.

Key to Genera.

A. Shell thin and delicate; spire elevated; umbilicus small, deep .. .. Lissospira.
B. Shell nearly flat-spired, with wide, open umbilicus; with spiral sculpture .. .. Circulus.
C. Shell planorbiform, spire concavely depressed, umbilicus wide, nucleus turned downward .. .. .. Cyclostremella.

Genus 1. Lissospira, K. J. Bush, 1897.

Lissospira, Bush, Trans. Connecticut Acad., x, 1897, 129. Type: *Cyclostrema proxima*, Tryon.

The radula consists of numerous rows of delicate teeth; each row having 1 broad central or median tooth, with a broad, blunt, delicately serrate, curved tip, and on either side 4 more slender lateral teeth,

also with blunt, curved, delicately serrate tips, beyond which is a series of numerous (between 30 and 50) long, very slender, somewhat sickle-shaped hooks, sometimes with delicately serrate tips.

Shell small, thin, of rather delicate texture, opaque white, slightly lustrous, of few convex whorls, forming an elevated spire, with relatively large prominent nuclear whorl and large body-whorl. Suture deep. Umbilicus small, deep, not showing any whorls. Aperture somewhat oblique, circular, with a slight sutural angle, not modified by the body-whorl, to which the simple, continuous peritreme is but slightly attached, often having an indistinct thread just within the inner lip, fading out above and below, so that it extends but about half-way round the aperture; it is much nearer the edge along the columellar margin than at the ends, and is evidently to prevent the thin operculum being drawn in too far. The operculum is circular, thin, of a delicate horn-colour, with central nucleus, of about 7 whorls, defined by a distinct spiral thread; often showing delicate microscopic transverse growth-lines.

KEY TO SPECIES.

a. Sculpture consisting of microscopic spiral striæ only .. .. *micra.*
b. Sculpture consisting of radiate riblets and microscopic spiral striæ .. *corulum.*

1. Lissospira corulum, Hutton, 1885. Plate 34, fig. 6.

Scalaria corulum, Hutt., T.N.Z.I., xvii, 1884 (1885), 322, pl. 18, f. 22 (*mala*); Hutt., Plioc. M., 67, pl. 8, f. 72. *Scala corulum*, Hutt.: Suter, T.N.Z.I., xxxix, 267. *Cyclostrema corulum*, Hutt.: Suter, P. Mal. S., viii, 24; Iredale, T.N.Z.I., xl, 382.

Shell minute, elevated turbinate, perforate, translucent, white, shining. *Sculpture* consisting of fine equidistant radiate riblets, about 28 on the last whorl, the interstices finely, microscopically spirally striate. *Colour* white. *Spire* conical, higher than the aperture, outlines convex. *Protoconch* small, globose, of 1 smooth whorl. *Whorls* 5, rather rapidly increasing, convex, the last with the periphery and base rounded. *Suture* deep. *Aperture* roundly ovate, angled above. *Peristome* continuous, sometimes thickened by a radiate riblet. *Columella* arcuate, very little expanded. *Perforation* narrow, partly hidden by the columella. *Operculum* not seen.

Diameter, 1 mm.; height, 1·5 mm.

Animal unknown.

Type, from the Pliocene, in the Canterbury Museum, Christchurch.

Hab.—Titahi Bay, Cook Strait, in sand (Miss Mestayer); Lyall Bay; Te Onepoto, Lyttelton.

Remark. — *Cyclostrema Angeli*, T.-Woods; *C. conica*, Watson; and *C. crebresculptum*, Tate, are very nearly allied species.

Fossil in the Pliocene.

2. **Lissospira micra**, Tenison-Woods, 1877. Plate 34, fig. 7.

Cyclostrema micra, T.-Woods, P.R.S. Tasm., 1876 (1877), 147. *C.* (*Tubiola*) *micra*, T.-Woods, Man. Conch. (1), x, 95, pl. 33, f. 13. *C. micron*, T.-Woods; Tate, P.R.S. S.Aust., xxiii, 221. *C. micra*, T.-Woods: Pritchard and Gatliff, P.R.S. Vict. (n.s.), xiv, 101; Suter, P. Mal. S., viii, 24.

Shell small, elevated turbinate, white, polished, umbilicated. *Sculpture* consisting of exceedingly fine microscopical spiral striæ, more distinct on the umbilicus. *Colour* white. *Spire* conical, outlines convex, a little higher than the aperture. *Protoconch* minute, sphærical, of 1 smooth translucent whorl. *Whorls* 5, regularly increasing, convex, the last rounded at the periphery; base convex. *Suture* deep. *Aperture* circular, slightly angled above. *Peristome* continuous, sharp, not thickened. *Columella* arcuate, thin. *Umbilicus* narrow, deep. *Operculum* horny, multispiral.

Diameter, 1·5 mm.; height, 2 mm.

Animal unknown.

Type destroyed by accident.

Hab.—Snares, in 50 fathoms (Captain Bollons). The type is from Tasmania, and it has also been found in South Australia and Victoria.

Genus 2. Circulus, Jeffreys, 1865.

Circulus, Jeffreys, Brit. Conchology, iii, 1865. Type: *C. Duminyi*, Requien.

Shell small, circular, depressed, not nacreous, of few more or less convex whorls, usually more or less grooved and carinated; aperture nearly circular, oblique, somewhat angulated below; peritreme simple, more or less continuous, in the adult modified on the body-whorl into a very thin glaze, which is absent in the young; umbilicus wide, the reverse of the spire; operculum thin, light horn-colour, with central nucleus, multispiral (?). (Bush.)

1. **Circulus sub-Tatei**, Suter, 1907. Plate 34, fig. 8.

Cyclostrema sub-Tatei, Suter, T.N.Z.I., xxxix, 1906 (1907), 258, pl. 9, f. 6–8.

Shell minute, subdiscoidal, spirally lirate, broadly umbilicated. *Sculpture* consisting of broad and shallow spiral grooves, slightly broader on the periphery, leaving between them narrow and sharply raised ridges, 10 on the last whorl. *Colour* white. *Spire* very low. *Protoconch* flatly convex, smooth, formed by 1 whorl. *Whorls* 3, the last large, flat near the suture, rounded at the periphery, and descending a little in front; base convex. *Suture* not much impressed. *Aperture* circular. *Peristome* continuous, solid. *Umbilicus* wide and perspective.

Diameter—Maj., 2·5 mm.; min., 2 mm.: height, 1·5 mm.

Dentition unknown.

Type in the Dominion Museum, Wellington.

Hab.—Near Channel Island, Hauraki Gulf, in 25 fathoms (type), near Little Barrier Island, in 20 fathoms; Lyall Bay; Snares, in 50 fathoms (Captain Bollons).

Remarks.—This species is nearly allied to *C. Tatei*, Angas, from South Australia; but the latter is larger, has a more elevated spire, the spiral ridges are less numerous, more distant on the upper side, and the interstices are ornamented with close fine and oblique radiate striæ, a feature totally absent in our species, there being only faint growth-striæ.

Genus 3. Cyclostremella, Bush, 1897.

Cyclostremella, Bush, Trans. Connecticut Acad., x, 1897, 140. [Type: *C. humilis*, Bush.

Shell minute, thin, semitransparent when fresh, planorbiform, of few convex whorls, nearly symmetrically coiled, forming a concavely depressed spire and large umbilical cavity. Epidermis thin, nearly colourless. Nuclear whorl relatively large, smooth, turned downward, seen only in a basal view, leaving a small pit above. Suture deep and channelled. Aperture triangular-ovate, expanded below, angulated above, with a relatively wide deep sinus just below the suture. Peritreme thin, simple, continuous, not modified, slightly attached. The operculum is very thin, almost colourless, broad-ovate, with the nucleus below the centre and represented by a small smooth space indefinitely defined by an indistinct line; from this arise numerous raised lines in the direction of the lines of growth, which are at first near together, but diverge toward the outer margin, where they terminate just within the edge; others arise between these, about two-thirds their length.

Distribution.—The type is from about 16 fathoms, off Cape Hatteras, North Carolina. A second species, *C. californica*, Bartsch, has been recorded from the Californian coast.

1. **Cyclostremella neozelanica**, Suter, 1908. Plate 34, fig. 9.

Cyclostremella neozelanica, Suter, P. Mal. S., viii, 25, pl. 2, f. 12.

Shell small, planorboid, radiately ribbed, broadly umbilicate. *Sculpture* consisting of close, sharp, radiate riblets, the smooth interstices of about the same width as the riblets; they are finer and closer together near the aperture. *Colour* white. *Spire* sunken. *Protoconch* very minute, of about 1 whorl, turned downward. *Whorls* 3, regularly increasing, leaving the apex considerably lower than any of the succeeding volutions, the last being the most elevated, and having a rounded periphery; base convex, very broadly and openly umbilicated. *Suture* strongly impressed. *Aperture* circular. *Peristome* discontinuous, thin. *Columella* short, arcuate, not thickened; the converging margins of the peristome connected by a thin parietal

callosity. *Umbilicus* of the same aspect as the sunken spire. *Operculum* unknown.

Diameter—Maj., 2 mm.; min., 1·6 mm.: height, 0·7 mm.

Animal unknown.

Type in my collection.

Hab.—Snares, in 50 fathoms (Captain Bollons).

Remark.—The suture of this species is not canaliculated, hence the circular aperture, not angled above.

Fam. **TURBINIDÆ**, Gray.

Animal with an oval, broad, or narrow foot, truncated anteriorly; rostrum rather short, truncate; tentacles long, slender, cylindrical, the eyes on peduncles at their exterior bases. Across the front of the head, between the tentacles, extends the more or less developed "veil"; and from a point below the tentacles a fleshy ridge (the "epipodial line") extends backward parallel with the margins of the foot, and bearing usually several slender cirri on either side.

Radula usually with the formula $\infty + 5 + 1 + 5 + \infty$, but sometimes lacking the median and 1 outer lateral tooth. The lateral teeth are all of nearly the same form. Jaws usually present.

Shell turbinate or trochiform, generally solid, smooth or rugulose; aperture circular, oval, or subtetragonal; peristome simple; operculum calcareous, heavy, flat or concave, with a thin corneous layer internally, the nucleus multispiral and either subcentral or at the margin.

Ordovician to Recent.

They are mostly littoral in station, and inhabitants of tropical and subtropical seas. They are herbivorous.

Key to Genera.

A. Shell turbinate, large, convex below; operculum convex outside, nucleus near centre .. .. .. Turbo.

B. Shell trochiform, young carinated and spinose: operculum with submarginal or terminal nucleus, generally with ribs outside .. .. Astræa.

C. Shell turbinate or globose, small, solid; operculum multispiral, concave in the centre outside .. .. .. Leptothyra.

Genus 1. Turbo, Linnæus, 1758.

Turbo, L., Syst. Nat., ed. x, 761. Type: *T. marmoratus*, L.

Head of animal proboscidiform, slightly extended in front; tentacles long and cylindrical; the ocular peduncles dilated, outside the base of the tentacles; epipodial line with a small number of cirri.

Shell turbinate or depressed, imperforate or umbilicate; young not carinated or spinose; base convex. Operculum flat or concave inside, with 3 or 4 whorls and subcentral nucleus; outside convex, smooth, tuberculate, or with concentric ribs.

Numerous species in the Tertiary.

Living in warmer or tropical seas.

Subgen. 1. Marmorostoma, Swainson, 1840.

Type: *T. porphyreticus*, Mart.

Shell depressed turbinate, very solid, umbilicate or imperforate, smooth, lirate or nodulose; spire depressed, of few whorls; aperture round, produced but not channelled at base; operculum circular, nucleus subcentral, outside convex, smooth or granulose; radula with a reflected simple cusp on the central tooth.

1. Turbo smaragdus, Martyn, 1784. Plate 40, fig. 7.

Helix smaragdus, Mart., Un. Conch., ii, f. 73, 74. *Turbo smaragdus*, Mart., Man. Conch. (1), x, 217. *T. helicinus*, Born, Index Mus. Cæs. Vindob., 1778, 355; not of Phipps, Voy. North Pole, 1774, 193. *T. smaragdus*, var. *tricostatus*, Hutton, P.L.S. N.S.W., ix, 1884, 355; Suter, T.N.Z.I., xxxviii, 323. *T.* (*Lunella*) *radina*, Webster, T.N.Z.I., xxxvii, 1904 (1905), 276, pl. 9, f. 1.

Shell rather large, heliciform, imperforate. *Sculpture:* The first few whorls with small spiniform projections above the suture, on a narrow, slightly projecting ledge, which with further growth of the shell forms a smooth ridge, margining the suture. The second, third, and sometimes the fourth are spirally ribbed; there is 1 rib on the earlier whorls, 3 on the fourth, followed by 2 low spiral ribs upon the base; this ornamentation is lost with further growth, the whorls becoming smooth; adult shells very seldom show any trace of sculpture, except strong oblique growth-lines and subobsolete spiral sulci, the whole of it being obliterated by erosion. *Colour* greenish-black. *Epidermis* thick, black, dull; beneath it the shell is green. *Spire* conoidal or conical, outlines convex, always lower than the height of aperture. *Protoconch* of 1½ whorls, depressed, white, smooth, mostly much eroded. *Whorls* 4 to 5, rapidly increasing, convex, the last large, depressed above and more or less concave below the suture; base flatly convex. *Suture* not deep. *Aperture* large, rounded, oblique, pearly-white within. *Outer lip* sharp, strongly convex, black-edged, and with a broad white callous band inside. *Columella* subvertical, strongly concave, smooth, white above, pearly at its base. The *inner lip* broadly spread out as a thick white callus over the excavated umbilical area, edged with light yellow or orange down to the base, and uniting the margins by a broad, thin, and widespread callosity. *Operculum* flat inside, with 4 to 7 whorls, the nucleus more than one-third the distance across the face; outside deep green, except on the side of increment, which is white; very minutely remotely granose.

Diameter, 50–60 mm.; height, 40–50 mm. Diameter, 70 mm.; height, 73 mm. (my largest specimen).

Dentition.—Troschel, Das Gebiss d. Schnecken, vol. ii, pl. 19, f. 1; Hutton, T.N.Z.I., xiv, 165, pl. 7, f. 6.

Animal.—Hutton, T.N.Z.I., xiii, 202.

Hab. — Throughout New Zealand, common on rocks and seaweeds between tide-marks. Kandavu, Fiji, on reefs ("Challenger" Exped.). Brought to England by Captain Cook.

Fossil in the Pliocene.

Vernacular name.—Cat's-eye shell.

Maori. — Akanakana (*fide* Quoy and Gaimard); korama (*fide* Captain Bollons).

Subgen. 2. Modelia, Gray, 1840.

Type: *Turbo granosus*, Mart.

Shell depressed, imperforate, granulate all over; operculum with a convex subcentral granular rib and a sharp-edged submarginal keel; central teeth of radula without a cusp.

2. Turbo granosus, Martyn, 1784. Plate 40, fig. 8.

Trochus granosus, Mart., Un. Conch., i, f. 37. *Turbo granosus*, Mart., Man. Conch. (1), x, 213, pl. 48, f. 39. *T.* (*Modelia*) *rubicundus*, Chemn.: Reeve, Conch. Icon., fig. 11. *Liotia* (*Arene*) *Shandi*, Hutton, C.M.M., 35 (young shell); Suter, T.N.Z.I., xxxviii, 323.

Shell subglobose, large, rather thin, imperforate, spirally granulose. *Sculpture* consisting of numerous subequal granose liræ, the upper 3 usually more distant and with larger granules, the lower ones closer together with smaller granules, about 12 on the penultimate whorl. *Colour* pinkish-yellow, unicoloured, or clouded with purplish or brown; umbilical depression bordered with pink on the outer side. *Spire* conoidal, with convex outlines, much lower than the height of aperture. *Protoconch* small, depressed, of 2 smooth whorls. *Whorls* 7, rounded, rapidly increasing, the last large and rounded, but slightly descending; base convex. *Suture* not much impressed. *Aperture* subcircular, a little oblique, iridescent and lirate within. *Outer lip* strongly convex, sharp, edged with purple. *Columella* high, concave, thick, smooth, white, nacreous on the inner side. *Inner lip* forming a thick white callous layer over the excavated umbilical tract; a thin, shining, rose-tinted callus covers the parietal wall. *Operculum* ovate, flat within, with 5 to 6 whorls and subcentral nucleus; outside white, thick, subgibbous, and minutely tuberculate at centre, subcanaliculate at the periphery.

Diameter, 50–65 mm.; height, 40–64 mm.

Dentition.—Hogg, Trans. Micr. Soc., 1866, pl. 11, f. 51.

Hab.—Cook Strait (Dr. Dieffenbach); Titahi Bay (Miss Mestayer); Bay of Islands; Lyttelton; Dunedin; Preservation Inlet; Foveaux Strait, in 18 fathoms (Captain Bollons); Stewart Island (C. Traill): Chatham Islands; Auckland Islands. Brought to England by Captain Cook.

The species is found from low-water mark to about 20 fathoms, and is mostly covered with a thick layer of Nulliporites.

Fossil in the Miocene and Pliocene.

Genus 2. Leptothyra, Dall, 1871.

Leptothyra, Dall, Amer. Journ. Conch., vii, 130. Type: *Turbo sanguineus*, L.
Leptonyx, Carpenter and A. Adams, Proc. Cal. Acad. Sci., iii, 1864, 175; not of Gray, 1837 (*Phocidæ*). *Collonia*, Philippi, Handbuch d. Conch., 206, not of Gray. *Collonia* (sp.), H. and A. Adams, Gray, Watson, &c.

Radula: The median teeth are oval, wide, with a narrow projection above, and more or less narrowed toward the base; the upper margin is in no case reflected, so that cusp, cutting-point, or edge, in any usual sense, there is none.

Shell small or minute, globose-depressed, solid, compact, umbilicate or imperforate; whorls 3–7, spirally sculptured, the last generally somewhat deflexed at the aperture; aperture subcircular, white and nacreous within; columella generally, but not always, bluntly denticulate near the base. Operculum subcircular, nearly flat or concavo-convex, inside with a very thin corneous layer, slightly convex, with many gradually increasing whorls, the nucleus subcentral, outside calcareous, subspiral, with a slightly convex concentric elevation or ridge around the margin, most prominent at its termination, the middle portion concave and more or less rugose.

The species are numerous, inhabiting nearly all tropical and subtropical seas, but most numerous in the Pacific.

Fossil.—Tertiary.

Key to Species.

A. Shell closely spirally lirate, the liræ numbering 25–35 on the last whorl .. .. *fluctuata.*
B. Shell strongly spirally ribbed, the ribs numbering 12–20 on the last whorl .. .. *crassicostata.*

1. Leptothyra crassicostata, Murdoch, 1905. Plate 34, fig. 10.

Leptothyra crassicostata, Murdoch, T.N.Z.I., xxxvii, 1904 (1905), 223, pl. 7, f. 11.

Shell small, solid, turbinate, umbilicate, with strong variable spiral sculpture. *Sculpture:* The penultimate whorl with 3 to 5, the last with 12 to 20 spiral ribs. The ribs are very variable in size; there are 5 to 8 strong riblets between the periphery and suture on the body-whorl; in front of the aperture 4 or 5 about equal to the breadth of the interspaces; on and immediately below the periphery the cinguli are frequently small and crowded, and similar on the base, or there may be 2 or 3 more prominent cinguli intercalated with the smaller ones, or the basal riblets may generally be stronger than those on the periphery; the growth-lines are strong and irregular, producing here and there a lightly costate appearance, frequently well pronounced in the umbilical area. *Colour* whitish or light brown, occasionally with irregular markings of brown, most distinct on and below the periphery. *Spire* low, rounded. *Protoconch* minute, smooth. *Whorls* 4, flattened below the suture, then convex, rapidly increasing; base convex. *Suture* impressed. *Aperture* subrotund, white inside.

Outer and *basal lip* acute, thickened inside. *Columella* arcuate, somewhat produced and expanded at the base. *Inner lip* spreading as a thick callus over the parietal wall. *Umbilicus* small and deep. *Operculum* circular, somewhat calcareous, of 6 or 7 narrow whorls; the nucleus central.

Diameter, 3·2 mm.; height, 2·5 mm.

Dentition unknown.

Type in the Dominion Museum, Wellington.

Hab.—Whangaroa Harbour (C. Traill); Snares, in 50 fathoms (Captain Bollons).

2. Leptothyra fluctuata, Hutton, 1883. Plate 34, fig. 11.

Cyclostrema fluctuata, Hutt., N.Z.J.S., i, 1883, 477; T.N.Z.I., xvi, 215.
Leptothyra fluctuata, Hutt., Man. Conch. (1), x, 259, pl. 64, f. 47, 48; Murdoch, T.N.Z.I., xxxvii, 222, pl. 7, f. 10.

Shell small, rather solid, spirally striated, umbilicate, not iridescent. *Sculpture* consisting of close spiral cinguli, 25 to 35 on the last whorl; the umbilical area smooth or cut up with strong irregular growth-periods. *Colour* yellowish-white, pale brownish, or pink, with irregular waved longitudinal bands of brown extending across the base, but not reaching the umbilicus. *Spire* depressed, outlines convex. *Protoconch* of 1 smooth white whorl. *Whorls* 3 to 4, rounded, the last large; base convex. *Suture* slightly impressed. *Aperture* subrotund, white within. *Outer* and *basal lip* convex, acute, thickened within. *Columella* vertical, concave, united by a thick callus with the basal lip. *Inner lip* forming a thin callosity upon the parietal wall. *Umbilicus* narrow, deep. *Operculum*, inside as usual in the genus, showing about 6 closely coiled whorls; outside subvitreous and translucent, nearly smooth, calcareous, slightly concave in the centre.

Diameter, 3 mm.; height, 2·25 mm.

Dentition unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—Foveaux Strait (type); Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons); Hauraki Gulf, in 20 fathoms (R. H. Shakespear); Whangaroa Harbour (C. Traill); Bounty and Snares Islands, in 50 fathoms (Captain Bollons).

Fossil in the Pliocene.

Var. immaculata, Suter, 1908.

Leptothyra fluctuata, var. *immaculata*, Suter, P. Mal. S., viii, 27.

Distinguished from the species in being larger, having more numerous closer spiral cinguli, and no colour-markings at all. My specimens (empty shells) are white.

Diameter, 4 mm.; height, 2·5 mm.

Type in my collection.

Hab.—Snares, in 50 fathoms (Captain Bollons).

Genus 3. Astræa, Bolten, 1798.

Astræa, Bolten. Mus. Bolten. (2), 1798, 79. Type: *A. imperialis*, Gmel. *Astralium*, Link. 1807. *Calcar* (Montfort), Fischer and other authors; *Imperator* (Montfort), Auct.; *Trochus* (in part) of all earlier authors; and *Turbo* (in part), Sowerby, jun., and others.

Animal and radula the same as in *Turbo*.

Shell trochiform, generally more or less flattened above or below; imperforate or umbilicate; young specimens always carinated and spinose at the periphery. Operculum oval or oblong, usually with submarginal or terminal multispiral nucleus; the last whorl forming the greater portion of the operculum, usually with 1 or several ribs exteriorly, following the course of the spiral, and most elevated at the distal extremity.

Inhabiting tropical and temperate seas.

Fossil.—Trias and Tertiary.

Key to Species.

A. Shell umbilicate, with large spines at periphery .. .. *heliotropium.*
B. Shell imperforate, with small spines at periphery .. .. *sulcata.*

Subgen. 1. Astræa, s. str.

Type: *A. imperialis*, Gmel. *Imperator*, Montfort, 1810; *Canthorbis*, Swainson, 1840; and (in part) *Guildfordia*, Gray, 1850.

The central and lateral teeth of the radula bear cusps; the marginals are not especially large toward the inside.

Shell large, trochiform, concave and umbilicate below, carinated and spinose at periphery; whorls convex and granulose above; operculum oval, outside smooth, obsoletely unicostate.

1. Astræa heliotropium, Martyn, 1784. Plate 41, fig. 1.

Trochus heliotropium, Mart., Un. Conch., i, 30, not of 1769. *Astralium heliotropium*, Mart., Man. Conch. (1), x, 228, pl. 56, f. 87. *Imperator aureolatus*, Montfort, Conch. Syst., 1810. *Canthorbis imperialis*, Swainson, 1840. *Guildfordia heliophorus*, Gray, 1850.

Shell large, depressed conic, widely umbilicate, solid, with large triangular spines at the periphery. *Sculpture* consisting of numerous scaly spiral ribs, obliquely running out to the spines of the periphery on the lower half of the whorls; base with 3 to 5 strong, scaly, spiral ribs of unequal size; umbilicus ornamented with strong, oblique growth-lines, which unite on approaching the base and form a distinct carina. *Colour* greenish- or bluish-grey, base mostly yellowish. *Spire* conoidal, its elevation very variable, about the same height as the aperture, outlines convex. *Protoconch* of 2½ smooth, flat, and strongly carinated whorls. *Whorls* 7, first slowly, then rapidly increasing, convex, acutely carinated and produced into long triangular spines, which are hollow, open on the anterior side, recurved, concave above, their number being exceedingly variable, as is also their shape; base

excavated in the middle, then flatly convex, and with a circular depression inside the circle of spines. *Suture* rendered zigzag by the prominent spines. *Aperture* transversely oval, pearly within. *Outer lip* convex, sharp, channelled, and much produced at the junction with the slightly convex and denticulate lower lip. *Columella* concave above, oblique and straight below, white and smooth. *Inner lip* slightly dilated, and impinging upon the umbilicus; parietal wall strongly iridescent, a thin glaze uniting the two margins. *Umbilicus* wide, deep, perspective. *Operculum* oval, with excentric nucleus; outside smooth, obsoletely unicostate.

Diameter, 100–120 mm.; height, 50–60 mm.

Dentition.—Hogg, Trans. Microsc. Soc., 1866, pl. 11, f. 46.

Hab.—From the Bay of Islands to Stewart Island; Cloudy Bay (Forster); Tasman Bay (Q. & G.); Auckland (Frauenfeld); Chatham Islands. From low-water mark to about 20 fathoms. Found also at Lord Howe Island. Brought to England by Captain Cook.

Fossil in the Pliocene.

Subgen. 2. Cookia, Lesson, 1832.

Cookia, Lesson, Illustr. Zool., 1832, pl. 15. Only species: *A. sulcata*, Mart.

Median tooth of radula with a long basal plate and short body; it bears no cusp, and has small supporting-wings.

Shell large, conical, imperforate; periphery rounded or keeled; base concave; umbilical tract concave, smooth; operculum ovate, narrowed toward the distal extremity, nucleus subterminal, outside with 2 convex smooth ribs.

2. Astræa sulcata, Martyn, 1784. Plate 41, fig. 2.

Trochus sulcatus, Mart., Un. Conch., i, f. 35, not of 1769. *Astralium sulcatum*, Mart., Man. Conch. (1), x, 242, pl. 64, f. 55. *Trochus Cooki*, Gmelin, Syst. Nat., ed. xiii, 1790, 3582. *Cookia nobilis*, Lesson, Illustr. Zool., 1832, pl. 15. *Puchypoma* (*Cookia*) *Cooki*, Chenu, Man. Conch., i, 351, f. 2581.

Shell large, conic, imperforate, rather thin, with oblique subtuberculose folds. *Sculpture* consisting of close lamellose growth-striæ and obliquely descending subtuberculose folds, which are directed forward; base with 5 to 6 slightly nodulous spiral ribs, crossed by close growth-lines. *Colour* purplish-grey or brown, centre of base fawn-coloured. *Spire* conoidal, more or less elevated, higher than the aperture. *Protoconch* small, depressed convex, of 2 smooth whorls. *Whorls* 7, well rounded, periphery convex; base flattened, deeply concave in the centre. *Suture* deeply impressed. *Aperture* transversely oval, very oblique, pearly and corrugated within. *Outer lip* strongly convex, denticulate, edged with brown; basal lip nearly straight, with an interior white callus. *Columella* arcuate above, straightened and very oblique below, thin, white above, pearly below.

Inner lip spread widely in a semicircle as a thin transparent glaze over the base, connecting the margins. *Umbilical area* deeply concave, bounded by a half-circular thread, which on reaching the lower part of the columella produces an indistinct tubercle. *Operculum* brownish or white outside.

Diameter, 65–90 mm. ; height, 65–80 mm.

Dentition.—Troschel, Das Gebiss d. Schnecken, ii, 127, pl. 20, f. 14 ; Hutton, T.N.Z.I., xv, 125, pl. 14, f. P.

Hab.—North and South Islands, as far south as Oamaru ; Chatham Islands. At low-water mark, and down to a few fathoms, mostly in exposed situations. Spengler and Chemnitz give the habitat Dusky Bay and Cook Strait. Brought to England by Captain Cook.

Maori.—Toitoi ; ngaruru (*fide* Captain Bollons).

Subsp. **Davisii**, Stowe, 1872. Plate 41, fig. 3.

Imperator Davisii, Stowe, T.N.Z.I., iv, 1871 (1872), 218. *Astralium sulcatum*, Mart., subsp. *Davisii*, Stowe : Suter, T.N.Z.I., xxxviii, 325. *Turbo Cooki*, Lam., Voy. Astrol., iii, 224, pl. 60, f. 19–23. *Risella kielmansegi*, Zelebor, Verhandl. Zool. Bot. Gesellsch. Wien, xvi, 1866, 913. *R. aurata*, Q. & G. : Hutton, J. de Conch., 1878, 27, not of Q. & G. *R. melanostoma*, Gmel. : Hutton, M.N.Z.M., 79 ; Suter, T.N.Z.I., xxxiv, 215, not of Gmelin. *Astralium pyramidale*, Webster, T.N.Z.I., xxxvii, 276, pl. 9, f. 2. (The last four names refer to young shells of the subspecies.)

Distinguished from the species by the high conical form and by the whorls being keeled at the periphery.

Diameter, 3·25 in. ; height, 4·5 in. (type specimen).

Type in the Dominion Museum, Wellington.

Hab.—The type specimen, much worn, was discovered at low water at the cliffs at Nelson by the late Mr. E. H. Davis, of the New Zealand Geological Survey ; Cook Strait ; Hauraki Gulf ; Banks Peninsula (Iredale).

Fam. **PHASIANELLIDÆ**, Troschel.

Animal with long tentacles, and usually pectinated head-lobes ; epipodial line usually with cirri ; branchial plume long ; foot narrow, long, pointed posteriorly, rounded before, below divided longitudinally by a median groove. Jaws rhomboidal, covered with imbricating scales. Radula rather short ; formula of teeth typically $\infty + 5 + 1 + 5 + \infty$, but sometimes lacking the median and outer lateral teeth.

Genus 1. Phasianella, Lamarck, 1804.

Phasianella, Lam., Ann. du Musée, iv, 295. Type : *P. australis*, Gmelin.

Shell imperforate, not nacreous, oval or oblong, polished ; aperture entire, oval, higher than broad, angulate in front ; columella smooth, compressed, attenuated at the base ; outer margin simple, sharp.

Distribution.—All tropical and subtropical seas.

Fossil.—Tertiary.

The animals are very active, the foot is much elongated when crawling, and they usually live together in numbers.

Vernacular Name.—Pheasant-shell.

Subgen. 1. Tricolia, Risso, 1826.

Tricolia, Risso, Hist. Nat. de l'Europe Mérid. Type: *Phasianella speciosa*, Mühlf.

The head of the animal without frontal lobes. Shell small.

1. Phasianella Huttoni, Pilsbry, 1888. Plate 34, fig. 12.

Rissoa flammulata, Hutton, J. de Conch., 1878, 28. *Phasianella Huttoni*, Pils., Man. Conch. (1), x, 174. *Barleeia flamulata*, Hutt., M.N.Z.M., 81. *Rissoa flammulata*, Hutt., P.L.S. N.S.W., ix, 941.

Shell small, ovate-elongate, thin, shining, imperforate, pink, smooth. *Sculpture* consisting only of subobsolete growth-lines, distinct only below the suture. *Colour* either uniformly bright rose, or rose with oblique rays of white; these rays are narrow and subequal, usually accompanied by broad white zigzag rays, situate between suture and periphery of the whorls; the rays are never extending upon the base, which is uniformly rose. *Epidermis* thin and glossy. *Spire* elevated, conic, nearly twice the height of the aperture. *Protoconch* small, conic, rather obtuse, of about 2 smooth whorls. *Whorls* 7, slightly convex; base convex. *Suture* impressed, sometimes submargined below. *Aperture* ovate, white within. *Outer* and *basal lip* rounded, with a rather blunt edge. *Columella* short, subvertical, white, broad, and smooth. *Inner lip* spread out very little beyond the columella, uniting the margins by a thick and white parietal callus. *Umbilical* area not depressed.

Diameter, 3·75 mm.; height, 6·75 mm.

Dentition unknown.

Type in the Otago Museum, Dunedin.

Hab.—Auckland (T. F. Cheeseman); Takapuna Beach (H. S.); Bay of Islands (J. C. Anderson).

Fam. **UMBONIIDÆ**, Adams.

Animal with the rostrum rudimentary; the frontal lobes greatly developed.

Shell orbicular, flattened, not umbilicated, the umbilical region often covered with a callous deposit; operculum horny, thin, of many gradually enlarging whorls, finely ciliated on the outer edge.

Distribution.—Indian and Pacific Oceans.

Fossil.—Devonian to Tertiary.

Genus 1. Ethalia, A. Adams, 1855.

Ethalia, A. Ad., P.Z.S., 1853 (1855), 189. Type: *E. guamense*, Q. & G.
Liotrochus, P. Fischer, J. de Conch., 1878, 207.

Shell orbicular, turbinately depressed; whorls convex, smooth or transversely striated, the last rounded at the periphery; umbilicus partly closed by a callus deposit; columellar lip ending anteriorly in an obtuse dilated callus.

The species are moderate-sized shells, depressed, the whorls convex, with a mottled or streaked colour-pattern. The callus emitted at the columellar-parietal angle of the aperture is tongue-shaped, closing the umbilicus except a rather narrow chink, or even entirely in some species.

1. **Ethalia zelandica,** Hombron and Jacquinot, 1854. Plate 39, figs. 9, 9*a*.

Rotella zelandica, H. & J., Voy. P.S., v, 53, pl. 14, f. 5, 6. *Ethalia zelandica*, H. & J., Man. Conch. (1), xi, 459, pl. 58, f. 9, 32, 33; pl. 59, f. 66; Suter, P. Mal. S., ii, 283. *Rotella lineolata* (Lam. ?), Gray, in Dieff. N.Z., 238. *Globulus angulifera*, Philippi, Conch. Cab. (1853 ?), 51, pl. 8, f. 3. *Umbonium chalconotum*, A. Adams, P.Z.S., 1853 (1855), 188. *U. zelandicum*, A. Adams, *l.c.*, 189.

Shell depressed, imperforate, yellowish or pinkish. *Sculpture:* Surface smooth, base showing under a lens very fine, close, regular spiral striæ. *Colour* yellowish or pinkish, radiately streaked with chestnut-brown or red above, base with a reddish or purple zone around the central callus, the outer part white, more or less striped radiately. *Epidermis* thin, shining, red and green reflections from the nacre are visible through it. *Spire* low, conoidal. *Protoconch* small, convexly depressed, brown, smooth, of 2 whorls. *Whorls* 6 to 7, first slowly, then more rapidly increasing, the last 2 whorls concave above, the compressed periphery of the last whorl encircled by 2 rather obscure carinæ; base slightly convex, with a narrow spiral groove bounding a central area, which is covered by a thin, radiately rugose, purple-and-white callus. *Suture* linear, not impressed. *Aperture* rounded quadrate, nacreous and iridescent within. *Outer* and *basal lip* sharp. *Columella* short, concave, thick, and heavy, its edge pearly. *Inner lip* forming a pad of white callus over the body and the axis.

Diameter, 19 mm.; height, 11 mm.

Dentition unknown.

Type in the Mus. Hist. Nat., Paris.

Hab.—Throughout New Zealand, in the laminarian zone; Kawhia (Dr. Dieffenbach); Spirit Bay, in 6 fathoms (Captain Bollons); Kermadec Islands.

Fossil in the Miocene and Pliocene.

Fam. NERITIDÆ, Lamarck.

Animal with a short broad muzzle and long slender tentacles, with the eyes on prominent peduncles at their outer bases; foot

oblong, wide in front, attenuated behind; branchia long, triangular, pointed, free at the extremity, ventricle embracing the intestine, anus on the right side; a cephalic male organ present. The formula of the teeth of the radula is $\infty 1 . (3 + 1 + 3) . 1 \infty$; the central tooth small, subquadrangular; second central tooth very large, transverse, subrhomboidal; third and fourth central teeth very small; lateral tooth with reflected, simple or denticulated margin; marginal teeth numerous, narrow, curved, serrated.

Shell imperforate, thick, semiglobose, porcellanous; spire very small, internally porcellanous, the cavity simple from the absorption of the internal portion of the whorls by the animal. Aperture semilunate, entire, the columellar lip flattened, septiform, with a rectilinear, plain, or dentate margin; outer lip rounded, sharp, or thickened, not reflected.

Operculum calcareous, usually subspiral, provided with projecting lobes on its inner face, the inner margin forming a pseudo-articulation with the columellar lip.

These molluscs are aquatic, although some species can normally live out of water. They are herbivorous, and deposit their eggs on their own shell or on that of another animal. The eggs are round or oval, with a thick, coriaceous, subcalcareous envelope, which separates transversally when the embryo emerges, the upper part of the capsule remaining attached to the lower part like a capsule.

Trias to Recent; living in tropical and warmer seas.

Genus 1. Nerita (L.), Lamarck, 1799.

Nerita, Linné, Syst. Nat., ed. x, 1758, 776; Lamarck, Mém. Soc. H.N., Paris. Type: *N. albicilla*, L. *Nerita*, Lam.: Man. Conch. (1), x, 4, 18.

Foot without anterior marginal groove, epipodial line consisting of a simple membranaceous duplication extending from the tentacles to the operculum; mantle-margin usually festooned.

Shell thick, smooth, or spirally ridged and grooved, porcellanous, under a corneous adhering epidermis—sometimes wanting; outer lip thick, usually denticulated within; columellar lip flattened, its margin dentate, straight. Operculum calcareous, the outer face granulated or with a decurrent groove, paucispiral, with excentric nucleus; inner face callous, the apical and claviform apophyses well marked, marginal apophysis more or less developed, corresponding with the groove of the outer face.

Animals living on rocks and stones, generally inactive by day, but said to be active at night, roaming about and feeding on algæ, &c. Gregarious, and littoral, and nearly exclusively marine.

About 200 species have been described, inhabiting tropical and semitropical shores throughout the world.

Fossil.—Cretaceous and Tertiary. The earlier forms are somewhat doubtful, and belong very likely to the genus *Neridomus*, M. & L.

Sect. 1. Peloronta, Oken, 1815.

Peloronta, Oken, Zool., 1815, 360. Type: *N. peloronta*, L. *Tenare*, Gray, P.Z.S., 1858, 92.

Columellar lip nearly smooth, its margin strongly dentate, outer lip dentate within.

1. Nerita melanotragus, E. A. Smith, 1884. Plate 39, fig. 10.

Nerita melanotragus, E. A. Smith, Zool. Coll., H.M.S. "Alert," 1884 (1, viii), 69. *N. nigra*, Gray, Dieff. N.Z., 240, not of Dillwyn, 1817. *N. atrata*, Chemn.: Reeve, Conch. Icon., ix, 1855, f. 16, not of Chemnitz nor Deshayes. *N. saturata*, Hutton, P.L.S. N.S.W., ix, 1884 (19, viii), 354. *N. punctata*, Q. & G.: Watson, Chal. Rep., xv, 132, not of Quoy and Gaimard. *N. atrata*, Reeve: Tryon, Man. Conch. (1), x, 26, pl. 8, f. 40. *N. melanotragus*, Smith: Hedley, P.L.S. N.S.W., 1900, 500; Suter, T.N.Z.I., xxxviii, 324.

Shell moderately large, solid, globose-oval, black. *Sculpture* consisting of irregularly disposed spiral grooves, which are narrow and shallow, having much broader interstices between them; growth-striæ fine, but with more or less distant well-marked periods of rest. *Colour* uniformly black, sometimes bluish-black. *Epidermis* solid, more or less shining. *Spire* low, rounded. *Protoconch* small, almost flat, smooth, greenish. *Whorls* 3, convex, very rapidly increasing, the last descending in front; base convex, no umbilical depression. *Suture* superficial. *Aperture* oblique, semicircular, white or bluish-white within. *Outer lip* solid, sharp, black-edged, more or less distinctly denticulate. *Columella* oblique, slightly concave, with 2 or 3 denticles in the middle. *Inner lip* forming a broad white and shining callus, which bears slight wrinkles and pustules. *Operculum* granulate on the outer face, pale purple, with 2 spiral bands of black.

Diameter, 23–35 mm.; height, 20–31 mm.

Dentition.—Hutton, T.N.Z.I., xv, 123, pl. 14, f. H.

Type in the British Museum.

Hab.—North Island, under stones between tide-marks; Kermadec Islands; Australia and Tasmania. Brought to England by Captain Cook.

Maori.—Ngarahutatawa (*fide* Captain Bollons).

Fam. COCCULINIDÆ, Dall.

Animal with a prominent head and muzzle, the males with an intromittant organ at the base of the right tentacle; a single lamellose asymmetrical gill between the under-surface of the mantle and the upper surface of the body from a point above and behind the head, extending around toward the right, and even backward on the right side; attached only at its base. Eyes wanting in the known species. Anus anterior, opening in a papilla above and behind the head. Mantle-margin and sides of foot plain, without epipodial papillæ or processes, but they are sometimes present behind. Radula with a

small or moderately raised central tooth, 3 moderate inner laterals with denticulate cusps, a larger denticulate major lateral with a stout and twisted stalk, and on each side a stout base from which spring numerous slender marginals hooked at their tips. There is no jaw.

Shell patelliform, not nacreous, symmetrical, with an entire non-sinuated margin and a posteriorly inclined apex with a (usually deciduous) spiral nucleus; muscular impression horseshoe-shaped, interrupted over the head.

Genus 1. Cocculina, Dall, 1882.

Cocculina, Dall., Proc. U.S. Nat. Mus., 1881 (1882), 402. Type: *C. Rathbuni*, Dall. *Cocculina*, Dall, "Blake" Gastropoda, 345; Man. Conch. (1), xii, 131. *Tectura* sp., Jeffreys, P.Z.S., 1882, 672.

The shell is colourless, with radiating and concentric sculpture; other characters are those of the family.

Anatomy.—Dr. Joh. Thiele, "Die beschalten Gastropoden der deutschen Tiefsee Expedition." B. Anatom. Systemat. Untersuch. einiger Gastropoden, 149–56, pl. 6, f. 1–22.

Distribution.—North Europe, north-eastern and western Atlantic, Indian Ocean, Philippines, Australasia. Deep-sea forms.

Key to Species.

A. Margin in one plane.
  a. Shell with minute concentric and radiate threads .. *tasmanica.*
  aa. Shell with the sides subparallel, surface distinctly cut up into granules by concentric and radiate sculpture *craticulata.*
B. Margin raised at both ends.
  a. Shell laterally compressed, summit anterior.. .. *compressa.*
  aa. Shell not laterally compressed, saddle-shaped, summit slightly posterior .. .. *clypidellæformis.*

1. Cocculina clypidellæformis, Suter, 1908. Plate 34, figs. 13, 13*a*.

Cocculina clypidellæformis, Suter, P. Mal. S., viii, 27, pl. 2, f. 19, 20.

Shell minute, having the shape of a *Clypidella—i.e.*, saddle-shaped—the sides descending, and the anterior and posterior margin slightly elevated; thin, translucent, smooth, apex slightly posterior. *Sculpture* consisting of concentric growth-lines only; they are fine and microscopic on the upper half, more conspicuous and irregular towards the base. *Colour* white. In the young shell the nucleus is minute, globose, and polished; adult shells have usually lost it. The *summit* is very little behind the middle in the adult roundish shell, but nearly at the posterior third in the young more oval shell; it is slightly raised, the anterior, posterior, and the lateral slopes are uneven, moderately convex. *Interior* greenish-white; muscular impression very distinct, forming a half-circle.

Length, 2·8 mm.; breadth, 2·5 mm.; height, 2·2 mm.

Animal unknown.

Type in my collection.

Hab.—Snares, in 50 fathoms (Captain Bollons).

2. **Cocculina compressa,** Suter, 1908. Plate 34, figs. 14, 14*a*.

Cocculina compressa, Suter, P. Mal. S., viii, 27, pl. 2, f. 17, 18.

Shell small, thin, laterally much compressed, the sides parallel, anterior and posterior end raised, navicular, the summit anterior and considerably raised. *Sculpture* consisting of fine rather distant and indistinct radiate striæ, crossed by distant concentric growth-lines. *Colour* white. *Nucleus* minute, resting on the narrowly elevated summit, situate at the anterior two-fifths of the length. Anterior and posterior slope straight, side slopes lightly convex. *Margin* sharp, smooth. *Interior* white.

Length, 5 mm. ; breadth, 2 mm. ; height, 2·8 mm.

Animal unknown.

Type in the collection of Miss Mestayer, Wellington.

Hab.—Flat Point, East Cape—one specimen (type) ; a second example was obtained in 38 fathoms, 5 miles south of Cuvier Island (Captain Bollons).

Remark.—A nearly allied form is the Australian *C. coercita*, Hedley (Rec. A.M., vi, 289, pl. 54, f. 1, 2), which, however, has no radiate striation, and the apex a little behind the centre.

3. **Cocculina craticulata,** Suter, 1908. Plate 34, figs. 15, 15*a*.

Cocculina craticulata, Suter, P. Mal. S., viii, 27, pl. 2, f. 15, 16.

Shell small, thin, oval, the sides subparallel, elevated. *Sculpture* consisting of subequal, distinct, close concentric grooves, reticulated by radiate grooves, which are slightly slanting to the left on the anterior slope, the surface being cut up into series of squarish granules, the summit having only concentric sculpture. *Colour* yellowish-green. *Nucleus* spiral, smooth, small, evidently deciduous, very little within the posterior margin. Posterior slope short, steep, concave ; anterior slope long, regularly rounded. *Inside* light green, shining.

Length, 2·8 mm. ; breadth, 1·8 mm. ; height, 1·2 mm.

Animal unknown.

Type in my collection.

Hab.—Dusky Sound, in 30 fathoms (R. Henry).

4. **Cocculina tasmanica,** Pilsbry, 1895. Plate 34, fig. 16.

Acmæa parva, Angas, var. *tasmanica*, Pils., "The Nautilus," ix, 128. *Cocculina tasmanica*, Murdoch and Suter, T.N.Z.I., xxxviii, 1905 (1906), 301. *Nacella tasmanica*, Tate and May, P.L.S. N.S.W., 1901, 411, pl. 27, f. 89, 90. *Cocculina meridionalis*, Hedley, Mem. A.M., iv, pt. 6, 1903, 331, f. 64 in text.

Shell small, thin, elevated, slightly asymmetrical. *Sculpture :* Fine dense concentric threads, crossed by fine and close radiate striæ, minutely decussating the surface, and indistinct anteriorly. *Colour* opaque-white. *Apex* smooth, inrolled, deciduous ; summit a little within the posterior margin. Posterior slope steep, a little concave ;

anterior slope long, arched. *Inside* white, shining, the posterior horse-shoe-shaped muscle-scar distinct.

Length, 3 mm.; breadth, 2·2 mm.; height, 1·5 mm. (type). Length, 3·25 mm.; breadth, 2·25 mm.; height, 1·6 mm. (*C. meridionalis*, Hedley).

Animal unknown.

Type in the cabinet of Mr. W. L. May, Sandford, Tasmania; cotype in my collection.

Hab.—About 15 miles off Great Barrier Island, in 110 fathoms; Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons); Auckland Islands, in 85 fathoms (E. R. Waite). Australia and Tasmania. The type was dredged by Mr. W. L. May in 10 fathoms, Frederick Henry Bay, Tasmania.

Fam. **HYDROCENIDÆ**, Fischer.

The animal having no gill, but a pulmonary cavity. Tentacles short, large; eyes prominent, situate at the upper or outer base of the tentacles. Foot short, oval, obtuse. The teeth of radula have the formula $\infty 1 . (1+1+1) . 1 \infty$; the central teeth are small, elongated; the lateral tooth is rather large, straight, without a cusp; the numerous lateral teeth are denticulate, and arranged in very oblique series.

Shell imperforate, conic and globular; whorls convex; spire short; peristome continuous; columella callous; lip not reflexed; operculum calcareous, ornamented with striæ which are concentric to the nucleus; inner side with a prominent apophysis arising from the nucleus.

Genus 1. Hydrocena, Pfeiffer, 1847.

Hydrocena, Pfr., Zeitschr. f. Malak., 1847, 112. Type: *H. cattaroensis*, Pfr.

Animal having the tentacles triangular, with large eyes at their upper base; operculum attached to the posterior part of the foot.

Shell imperforate, small, amber-colour; whorls few, convex; aperture oval, angled above, margins united by a thin callosity extending across the body-wall; peristome not reflected, not thickened; columella slightly concave; umbilical tract closed by a callosity; Operculum subconcentric, with a nucleus showing sometimes an apparent spiral structure on its outer face.

The type lives in the marine littoral zone, near Cattaro, Dalmatia.

1. **Hydrocena Purchasi**, Pfeiffer, 1862. Plate 34, fig. 17.

Hydrocena Purchasi, Pfr., Malak. Blätter, viii, 1862, 150; Hedley and Suter, P.L.S. N.S.W. (2), vii, 623; Suter, J. de Conch., xli, 227. *Assiminea Purchasi*, Pfr.: Hutton, M.N.Z.M., 40.

Shell minute, globosely conical, translucid, imperforate. *Sculpture* consisting of very fine growth-striæ only. *Colour* horny-fuscous. *Epidermis* thin, shining. *Spire* conical, rather obtuse. *Protoconch* minute, strongly convex, smooth. *Whorls* 4 to 5, convex, the last

slightly exceeding one-third of the height of the shell; base convex. *Suture* impressed. *Aperture* a little oblique, subcircular. *Peristome* simple, straight. *Columella* slightly concave, white. Inner lip spreading over the umbilicus, sealing it up more or less completely. The callus on the penultimate whorl unites the margins, and is conspicuous.

Diameter, 1 mm.; height, 2 mm.

Dentition.—Suter, T.N.Z.I., xxiv, 301, pl. 23, f. 58.

Type in the K.K. Hofmuseum, Vienna.

Hab.—North Island: Bay of Islands (Purchas, Hochstetter); Waro; Whangarei; vicinity of Auckland; Wairangi, Waikato; Hunua Range; Mount Pirongia; Forty-mile Bush. South Island: Kenepuru Sound; Nelson; Wairoa Gorge; Greymouth; Riccarton Bush, near Christchurch.

Found in native bush in very moist situations, near creeks or swamps, under stones, rotten wood, &c.

Order 2. PECTINIBRANCHIA.

(= *Monotocardes; Ctenobranchia.*)

These are *Streptoneura* with a somewhat concentrated nervous system; without a labial commissure, except in *Viripara* and *Ampullaria*. The nerve-collar is situated behind the buccal bulb, except in the latter genus. There is a single well-differentiated, independent, and often pectinated osphradium. The eye is always closed, and the internal cornea (pellucida) is extensive. Each otocyst contains a single otolith, except in some forms of *Tænioglossa* devoid of a proboscis. The central tooth of the radula is single or absent. There is no longer any trace of bilateral symmetry in the circulatory, respiratory, and excretory organs, the topographically right half of the pallial complex having completely disappeared. The ctenidium is monopectinate, and attached to the mantle throughout its whole length, except in *Adcorbis* and *Valvata*. The single kidney usually opens directly by a slit-shaped aperture, and never serves for the passage of the sexual products. The genital gland always has a separate orifice of its own. The male generally has an intromittant organ.

The *Pectinibranchia* are divided into two suborders—*Tænioglossa* and *Stenoglossa*.

Suborder 1. TÆNIOGLOSSA, Troschel.

In these Pectinibranchs the radula has normally 3 teeth on each side of the median tooth—viz., 1 lateral and 2 marginals. The stomatogastric ganglia are situated behind the buccal mass, and are united to the cerebral centres by long connectives, which are in part recurrent and deeply situated. The salivary ducts, when sufficiently long,

traverse the nerve-collar. The œsophagus is nearly always devoid of an unpaired gland. Usually there is neither a proboscis nor a siphon.

The suborder includes two distinct groups or tribes, which are respectively creeping and swimming forms—namely, the *Platypoda* and *Heteropoda*.

Tribe 1. PLATYPODA.

Normal *Taenioglossa*, but slightly modified, and of creeping habit. The foot is flattened ventrally—at all events, in its anterior part. The otocysts are situated close to the pedal nerve-centres. Accessory organs are rarely found on the genital ducts, but are present in *Viviparа*, *Cyclostoma*, the *Naticidæ*, *Calyptræidæ*, &c. Mandibles are usually present. The intestine is long.

The *Platypoda* form the largest group of the Mollusca, comprising nearly sixty families of unequal value, some of which are not thoroughly well known from an anatomical point of view.

Fam. CYCLOPHORIDÆ, Gray.

Animal having long cylindrical tentacles, subulate toward the extremities; eyes at their outer bases on very short peduncles; foot long, attenuate behind. Pallial cavity devoid of a ctenidium and transformed into a lung; pedal centres in the form of ganglionated cords; otocysts with otoconia. Jaws reticulate. Radula having the formula 2.1.1.1.2; central tooth contracted in the middle, with 3 to 5 cusps; lateral and marginal teeth arranged in oblique rows curved, all of the same form, and with 2 or 3 cusps.

Shell conical or depressed, usually covered with a horny epidermis; aperture circular, peristome simple or reflexed; operculum distinctly spiral, testaceous or horny; whorls very numerous and subequal, or few and rapidly increasing.

These molluscs are terrestrial, and appear first in the Cretaceous.

Genus 1. LAGOCHILUS, Blanford, 1864.

Lagochilus, Blanford, A.M.N.H. (3), xiii, 452. Type: *L. tomotrema*, Benson.
Lagochilus, Blanford: Moellendorff, P.L.S. N.S.W. (2), vii, 1892, 385; P. and F. Sarasin, "Die Land-Mollusken von Celebes," 1899, 25.

Animal having a glandular slit at the extremity of the foot.

The teeth of radula are distinguished from those of *Leptopoma* by the sharply pointed cusps of nearly equal size, none of them being much broader than the others.

Shell conoidal, subturbinate, thin, with an epidermis. Aperture circular; peristome mostly reflected, forming a more or less distinct angle or slit at its insertion above. Operculum circular, thin, horny, with 7 to 9 volutions, the margins of which are sometimes slightly elevated upon the outer face.

Distribution.—The genus ranges from India and China to the Philippines, the Malayan Archipelago, New Guinea, and New Zealand.

KEY TO SPECIES.

A. Spire of shell the same height as that of the aperture, or but little higher.
  a. Whorls spirally lirate.
    1. Base bicarinate .. .. *bicarinatum.*
    2. Subobsolete spiral striæ on base only .. .. *pannosum.*
    3. Regularly decussate, hairs at intersections .. *cytora.*
    4. With membranous radiate plaits, getting gradually more distant on approaching the aperture .. *Hedleyi.*
  aa. Whorls without spiral sculpture.
    1. With irregular radiate threads; rufous or brown .. *lignarium.*
    2. With regular growth-lines only; horny .. .. *Studeri.*
B. Spire considerably higher than the aperture.
  a. Last whorl angled or subangled.
    1. No sculpture, except growth-lines .. .. *calvum.*
    2. Spirally lirate .. .. *pallidum.*
  aa. Last whorl rounded.
    b. Perforation covered.
      1. Height of shell less than 2 mm. .. .. *torquillum.*
      2. Height of shell more than 2 mm. .. .. *Chiltoni.*
    bb. Subperforate, perforation partly open .. .. *fasciatum.*

Subgen. 1. CYTORA, Kobelt, 1902.

Cytora, Kobelt and Moellendorff, Nachrichtsblatt Deutsch. Malak. Gesellsch., 1897, 85 (name only). Type: *L. cytora*, Gray. *Cytora*, Kobelt, in "Das Tierreich," 16, Lief., 1902, 65. *Murdochia*, Ancey, J. de Conch., xlix, 1901, 24.

Shell small, thin; epidermis usually smooth, rarely with membranous processes or hairs; sutural notch of the peristome slight. Operculum horny, not calareous, with subcentral nucleus and few volutions.

1. Lagochilus bicarinatum, Suter, 1907. Plate 11, fig. 10.

Lagochilus bicarinatum, Suter, P. Mal. S., vii, 1907, 238, pl. 22, f. 10.

Shell small, turbinate, umbilicate, base bicarinate. *Sculpture* consisting of fine, subequidistant, blunt, incremental axial striæ, 2 carinæ on the base, the upper one arising from the junction of the outer lip with the whorl, and terminating a little below the middle of the outer lip; the lower rib departs from the middle of the body-whorl between the margins of the aperture, and ends at the distal side of the basal lip; no spiral striation is present. *Colour* fulvous to brown. *Epidermis* thin, slightly shining; there may be axial membranaceous plaits, but in the only specimen before me they have evidently been lost. *Spire* conical, of the same height as the aperture, apex obtuse. *Protoconch* consisting of 1 whorl, which is globular and smooth. *Suture* deeply impressed. *Aperture* circular. *Peristome* slightly reflexed and callous, but sharp; notch at the suture very indistinct. *Columella* concave, partly concealing the umbilicus, which is deep and of about ½ mm. diameter. The *umbilical tract* immersed and margined by the lower carina. *Operculum* thin, circular, multispiral, with membranous outer and central processes.

Diameter, 4·5 mm. ; height, 5 mm.
Dentition unknown.
Type in my collection.
Hab.—Kamo, North Island, type (C. Cooper).

2. **Lagochilus calvum,** Hutton, 1883. Plate 35, fig. 1.

Leptopoma calva, Hutt., T.N.Z.I., xv, 1882 (1883), 140. *Lagochilus calvum*, Hutt. : Hedley and Suter, P.L.S. N.S.W. (2), vii, 621 ; Suter, J. de Conch., xli, 224.

Shell conical, perforate, brown, periphery rounded. *Sculpture* consisting simply of numerous fine oblique growth-lines. *Colour* reddish-brown, with a narrow spiral pale band below the periphery. *Spire* acutely conical, much higher than the aperture. *Whorls* 6½, rather flattened, the last subangled at the periphery ; base convex. *Suture* impressed. *Aperture* oblique, roundly ovate. *Peristome* sharp, regularly rounded. *Columella* subvertical, arcuate. *Perforation* narrow, but open. *Operculum* horny, thin, transparent, of about 5 gradually enlarging whorls ; nucleus subcentral.

Diameter, 2 mm. ; height, 3·25 mm.
Dentition resembling that of *L. pannosum* (Hutton).
Type in the Canterbury Museum, Christchurch.
Hab.—Greymouth (R. Helms).
Remarks.—The only specimen I have ever seen is the type. The species would seem to be rare, and local in distribution.

3. **Lagochilus Chiltoni,** Suter, 1896. Plate 10, fig. 1.

Lagochilus Chiltoni, Suter, P. Mal. S., ii, 33, pl. 4, f. 1.

Shell very small, turbinate, subperforate, rufous, slightly glossy, semitransparent. *Sculpture* consisting of nearly equidistant, rather close, radiate, and partly membranaceous riblets, about 5 to 6 per millimetre on the last whorl ; the whole surface faintly microscopically spirally striate. *Colour* uniformly rufous. *Epidermis* thin and horny, easily worn off. *Spire* conical, apex rather pointed, higher than the aperture. *Protoconch* small, papillate, shining, of 2 convex whorls, faintly spirally striate, the second reticulated by additional close radiate striæ. *Whorls* 5, convex, the first 3 slowly, the others more rapidly increasing, the last rounded at the periphery ; base convex. *Suture* impressed. *Aperture* slightly oblique, subcircular. *Peristome* simple, straight, notch at the suture very slightly indicated. *Columella* arcuate, slightly callous, expanded and completely covering the small umbilicus. *Operculum* not known.

Diameter, 2·25 mm. ; height, 3 mm.
Dentition unknown.
Type in my collection.
Hab.—Fern Flat, Buller River, South Island, type (Dr. Chilton) ; Wairangi, Waikato (A. Suter).
Remark.—The specimen from the latter locality is slightly more slender, and darker in colour.

Subsp. **septentrionale**, Suter, 1907. Plate 11, fig. 9.

Lagochilus Chiltoni, subsp. *septentrionale*, Suter, P. Mal. S., vii, 1907, 238, pl. 22, f. 9.

Distinguished from the species by the following characters: It is considerably larger, the spiral striation is quite distinct, especially upon the base, and the umbilicus is a little larger and open, not covered over by the reflection of the inner lip. Operculum unknown.

Diameter, 3 mm.; height, 4 mm.

Dentition unknown.

Type in my collection.

Hab.—Cowes Bay, Waiheke Island, type (H. S.); Cape Camel, near the North Cape (C. Cooper).

Remarks.—The specimens from Cape Camel are slightly more slender, the umbilical tract is angled, and the last whorl has a whitish spiral band above the periphery in some examples.

4. **Lagochilus cytora**, Gray, 1850. Plate 35, fig. 2.

Cyclophora cytora, Gray, P.Z.S., 1849 (1850), 167; A.M.N.H. (2), vii, 68; Pfeiffer, Mon. Pneum. viv., i, 86. *Lagochilus cytora*, Gray: Hedley and Suter, P.L.S. N.S.W. (2), vii, 621; Suter, J. de Conch., xli, 223.

Shell minute, turbinate, perforate, rather solid. *Sculpture* consisting of distant regular spiral threads, crossed by oblique membranaceous, subequidistant, hairlike riblets; at the points of intersection short epidermal hairs arise. *Colour* brown or horny. *Epidermis* thin, easily rubbed off, not shining. *Spire* short, slightly convex, acute, but little higher than the aperture. *Protoconch* of 3 dark-brown, shining, strongly convex whorls, the first 2 smooth, the third radiately ribbed. *Whorls* $5\frac{1}{2}$, moderately convex, the last with a slight emargination at the upper end of the peristome; base convex. *Suture* impressed. *Aperture* oblique, nearly circular. *Peristome* simple, straight, thickened internally, with the margins approximate, united by a thin callus. *Columella* short, oblique, arched, half-covering the narrow but deep perforation. *Operculum* of a few whorls only.

Diameter, 2·5 mm.; height, 2 mm.

Animal and *dentition* unknown.

Type in the British Museum.

Hab.—Auckland, type (Greenwood); Howick; Ohaupo; Hunua Range; Mount Pirongia; Wairangi, Waikato. Living in damp places of the bush, in mould, under rotten pieces of wood, sometimes on fronds of ferns.

5. **Lagochilus fasciatum**, Suter, 1894. Plate 35, fig. 3.

Lagochilus fasciatum, Suter, T.N.Z.I., xxvi, 1893 (1894), 132, pl. 19, f. 30, 31.

Shell small, turbinate, subperforate, rufous, thin. *Sculpture* consisting of thin, close, membranaceous, white, slightly waved radiate

plaits, often produced below the suture, about 11 or 12 per millimetre on the last whorl; interstices with numerous fine but distinct spiral striæ. *Colour* rufous, with a pale band on the periphery, or horny with a brown peripheral band. *Epidermis* thin, horny. *Spire* conical, apex rather blunt, higher than the aperture. *Protoconch* papillate, of 2 very convex, smooth whorls, the second with a few radiate striæ. A magnifying-power of about 100 reveals faint spiral striation. *Whorls* 6, first regularly and slowly, the last rapidly increasing; base convex. *Suture* impressed. *Aperture* oblique, subcircular. *Peristome* simple, straight, strengthened inside by a narrow callosity; notch at the suture slight but distinct. *Columella* arcuate, with a white callosity inside, which extends over the body, uniting the converging margins. *Umbilicus* narrow, pervious, partly covered by the slight columellar expansion. *Operculum* unknown.

Diameter, 2·5 mm.; height, 2 mm.

Dentition unknown.

Type in my collection.

Hab.—Near Manaia, Waimate Plains, North Island (R. Murdoch).

6. **Lagochilus Hedleyi,** Suter, 1894. Plate 35, fig. 4.

Lagochilus Hedleyi, Suter, P.L.S. N.S.W. (2), viii, 184, pl. 22, f. 1–1*d*.

Shell very small, turbinate, perforated, rather thin. *Sculpture* consisting of radiate white membranaceous plaits, close together on the penultimate whorl, but gradually getting more distant on approaching the aperture, where there are about 9 plaits per millimetre. Between the plaits a good lens reveals close fine spiral striæ, crossed by equally fine growth-lines. *Colour* rufous or pale horny. *Epidermis* thin, not shining, easily rubbed off. *Spire* conical, nearly as high as broad, a little higher than the aperture. *Protoconch* small, papillate, of 2 whorls, the first smooth, the second microscopically spirally striate. *Whorls* 5, rounded, the last rapidly increasing, rounded at the periphery; base convex. *Suture* deep. *Aperture* nearly circular, diagonal. *Peristome* simple, straight, slightly callous inside, the margins approximating and united by a thin parietal callus; notch at the suture very slight. *Columella* arcuate, callous inside, not reflexed. *Umbilicus* pervious, very narrow, deep, partly hidden by the last whorl. *Operculum* horny, slightly concave, of few whorls only, nucleus central.

Diameter—Maj., 2 mm.; min., 1·75 mm.: height, 2·25 mm.

Dentition unknown.

Type in my collection.

Hab.—North Island only: Hunua Range, type (Major Broun); Hillyer's Creek, near Auckland (C. Musson); Birkenhead (H. S.); Waitakerei Range (H. S.); Mount Pirongia (A. T. Urquhart).

7. **Lagochilus lignarium**, Pfeiffer, 1857. Plate 35, fig. 5.

Cyclostoma lignarium, Pfr., P.Z.S., 1857, 112; Mon. Pneum. viv., ii, 44; Reeve, Conch. Icon., xiii, Cyclophorus, f. 94. *Lagochilus lignarium*, Pfr.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 621; Suter, J. de Conch., xli 224; J. Mal., vii, 53.

Shell small, umbilicated, turbinated, rather thin. *Sculpture* consisting of irregular, membranaceous radiate threads, extending to the umbilicus; there is no trace of spiral sculpture. *Colour* rufous to light brown. *Epidermis* rather thick, opaque. *Spire* conoidal, outlines straight, of about the same height as the aperture. *Protoconch* of 2 whorls, papillate, dark brown, smooth, and shining. *Whorls* 5 to 5½ convex, the first 3 slowly, the others more rapidly increasing; base flatly convex. *Suture* well impressed. *Aperture* oblique, ovately rotund. *Peristome* continuous over the parietal wall, mostly sharp, but sometimes double, the outer one membranaceous and narrowly expanded, with a slight notch at the suture; callous inside. *Columella* oblique, arcuate, slightly callous, not reflexed. *Umbilicus* narrow, open, deep, about one-seventh of the major diameter of the shell. *Operculum* horny, thin, of few whorls.

Diameter—Maj., 5 mm.; min. 4·6 mm.: height, 4 mm.: aperture height, 2·6 mm. Almost all the specimens I found were a little smaller.

Animal with a distinct posterior glandular notch.

Dentition unknown.

Type in the British Museum.

Hab.—North Island: Near Wellington; Forty-mile Bush. South Island: Wairoa Gorge; Kenepuru Sound.

This rare shell is living in moist places of the bush, sometimes inside rotten logs.

8. **Lagochilus pallidum**, Hutton, 1883. Plate 35, fig. 6.

Leptopoma (?) *pallida*, Hutt., N.Z.J.S., i, 1883, 477; T.N.Z.I., xvi, 1883 (1884), 184, 210. *Lagochilus pallidum*, Hutt.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 621; Suter, J. de Conch., xli, 224.

Shell small, conical, subperforated, pale brown. *Sculpture* consisting of rather distant, irregular, and low spiral liræ, 2 to 3 on the spire-whorls, 5 on the last whorl above the periphery, and about 5 upon the base, crossed by numerous oblique growth-lines and distant membranaceous plaits, which are easily rubbed off. *Colour* pale brown, sometimes with a narrow pale band at the periphery of the last whorl and 1 around the middle of the base. *Epidermis* thin, horny, not shining. *Spire* acutely conical, the apex obtusely rounded, higher than the aperture. *Protoconch* small, papillate, of 2 convex, dark-brown and shining whorls, the first with a few faint spiral striæ, the second closely radiately striate. *Whorls* 5½, rounded, the last distinctly angled at the periphery; base flatly convex, depressed round

the umbilicus, but not keeled. *Suture* impressed. *Aperture* slightly oblique, subcircular, angled above. *Peristome* thin, regularly arched, callous within, continuous over the parietal wall; notch at the suture but slight. *Columella* arcuate, subvertical, with a white inner callus, slightly expanded over the umbilicus, which is narrow and deep. *Operculum* thin, horny, with about 5 whorls; nucleus subcentral.

Diameter, 3·25 mm.; height, 5 mm.

Dentition unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—North Island only: Te Reinga; Tom Bowline's Bay; Whangaroa (C. Cooper); Kaihu, Hokianga; Waitakerei Range (H. S.); Waiwera; Birkenhead; Mount Pirongia. The type is from "Auckland," exact locality not stated (T. F. Cheeseman).

Var. *albida*, an almost colourless, translucent specimen from Broadwood, Hokianga, is in my collection.

9. **Lagochilus pannosum**, Hutton, 1883. Plate 35, fig. 7.

Leptopoma pannosa, Hutt., T.N.Z.I., xv, 1882 (1883), 140. *Lagochilus pannosum*, Hutt.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 621; Suter, J. de Conch., xli, 224.

Shell conical, angled at periphery, perforate, brown, covered with a dark-fuscous, ragged epidermis. *Sculpture* consisting of oblique, very irregular, radiate, and rather distant plaits, produced into triangular membranaceous processes at and sometimes below the periphery; base with fine radiate threads crossed by fine spiral striæ, which, however, are mostly subobsolete. *Colour* uniformly brown. *Epidermis* thin, processes easily worn off, dull. *Spire* acutely conical, very little higher than the aperture. *Protoconch* small, papillate, of 2 smooth, strongly convex, and dark-brown shining whorls. *Whorls* 6, rather flattened, the last angled at the periphery; base flattish. *Suture* impressed. *Aperture* rather oblique, broadly ovate. *Peristome* thin, regularly arched, or slightly angulated at the periphery, very little callous inside; very slightly patulous. *Columella* slightly oblique, arcuate, callous inside, and slightly expanded toward the narrow but open perforation; there is no parietal callosity. *Operculum* horny, of 5 whorls; nucleus subcentral.

Diameter, 2·75 mm.; height, 3·25 mm.

Animal.—Rostrum emarginate; tentacles short, slightly tapered, and rounded at the ends; the eyes on slight bulgings at their bases; foot short, not produced much beyond the operculum; tail rounded. Body and foot brown; tentacles and a band on each side of the head purple; rostrum broadly margined with white, and the tentacles minutely tipped with the same colour. (Hutton.)

Dentition.—Hutton, T.N.Z.I., xvi, 173, pl. 10, f. U.

Type in the Canterbury Museum, Christchurch.

Hab.—Greymouth (R. Helms).

10. Lagochilus Studeri, Suter, 1896. Plate 10, fig. 2.

Lagochilus Studeri, Suter, P. Mal. S., ii, 34, pl. 4, f. 2.

Shell very small, globosely conoidal, perforate, whitish-horny, faintly glossy, fragile, translucent. *Sculpture* consisting simply of regular and close growth-lines. *Colour* uniformly whitish-horny. *Epidermis* very thin, glossy. *Spire* conoidal, rather short, height the same as that of the aperture. *Protoconch* globose, smooth. *Whorls* $3\frac{1}{2}$, rather rapidly increasing, convex, slightly flattened below the suture, the last with a rounded periphery; base convex. *Suture* deep. *Aperture* ovate, higher than broad. *Peristome* simple, acute. *Outer lip* regularly arched; *basal lip* acutely convex. *Columella* almost straight, vertical; no callosity uniting the converging margins. There is no indication of a notch at the suture. *Umbilicus* pervious, very narrow. *Operculum* thin, horny, with a few whorls round a subcentral nucleus.

Diameter, 2·25 mm.; height, 3 mm.; height of aperture, 1·5 mm.

Dentition unknown.

Type in my collection.

Hab.—Whangarei, type (Mr. Grosch).

Remark.—The only specimen I have is immature, and the generic position is somewhat doubtful.

11. Lagochilus torquillum, Suter, 1894. Plate 35, fig. 8.

Lagochilus torquillum, Suter, P.L.S. N.S.W. (2), viii, 485, pl. 22, f. 2–2*b*.

Shell minute, conical, subperforated, rufous, thin and fragile, semi-transparent. *Sculpture* consisting of close white membranaceous and oblique radiate plaits, directed slightly backward; there are about 15 per millimetre on the last whorl; interstices microscopically spirally striate, more distinct on the base. *Colour* uniformly rufous. *Epidermis* thin, horny, not shining. *Spire* acutely conical, with a rather sharp apex, higher than the aperture. *Protoconch* papillate, of 2 whorls, which are finely spirally striate and strongly convex. *Whorls* 5, the last occupying nearly half of the total height, strongly convex, rounded at the periphery; base convex. *Suture* deep. *Aperture* oblique, circular. *Peristome* simple, straight, the margins not meeting, but united by a thin parietal callosity, no notch at the suture. *Columella* arcuate, thin, a little reflected over the narrow perforation, which in adult specimens is entirely covered. *Operculum* unknown.

Diameter, 1·25 mm.; height, 1·75 mm.

Dentition unknown.

Type in my collection.

Hab.—Howick, type (Major Broun); Hunua Range; bush near Napier (A. G. Clark).

Fam. DIPLOMMATINIDÆ.

Shell small, dextral or sinistral, umbilicated or subperforated; whorls convex; aperture subcircular; peristome usually double, outer lip expanded, columella sometimes with a spiral fold. *Operculum* horny or calcareous, concave, of few whorls.

The metropolis of this family is the Oriental or Palæotropical region.

Genus 1. PALAINA, O. Semper, 1865.

Type: *P. alata*, Semper.

Shell mostly sinistral. The last whorl is constricted at its beginning or at the last fourth. Aperture without spiral fold.

1. Palaina chordata, Pfeiffer, 1855.

Diplommatina chordata, Pfr., P.Z.S., 1855, 105; Mon. Pneum. viv., ii, 12; Hedley and Suter, P.L.S. N.S.W. (2), vii, 620; Suter, J. de Conch., xli, 223.

Shell sinistral, deeply rimated, subfusiform, diaphanous, thin. *Sculpture* consisting of somewhat distant cord-shaped radiate riblets. *Colour* waxy-whitish. *Epidermis* very thin. *Spire* ovately conical, apex acute. *Whorls* 7, convex, the last attenuated, ascending anteriorly. *Aperture* slightly oblique, subcircular. *Peristome* double. The *outer lip* shortly spread out, the *inner lip* continuous over the parietal wall, shortly adnate, otherwise rather expanded.

Diameter, 2 mm.; height, 4 mm.

Type in the British Museum.

Hab.—New Zealand (Strange, *fide* Cuming).

Remark.—I have not seen this species, and its occurrence in New Zealand requires confirmation.

Genus 2. GASTROPTYCHIA, Kobelt and Moellendorff, 1900.

Gastroptychia, Kobelt and Moellendorff, Nachrichtsblatt d. Deutsch. Mal. Gesellsch., 1900, 186. Type: *Paxillus adversus*, H. and A. Adams. *Paxillus*, H. and A. Adams, A.M.N.H. (2), vii, 1851, 63, not of Michean.

Shell pupiform, rimate, smooth; spire acuminated; aperture semiovate, ascending on the body-whorl; inner lip adnate, spreading, flexuous, with a prominent tooth-like fold in the middle; outer lip double, emarginate anteriorly; umbilical region with a spiral elevated ridge ending in a notch at the fore part of the aperture; operculum orbicular, of many gradually enlarging whorls; nucleus central.

1. Gastroptychia peregrina, Gould, 1847.

Balea peregrina, Gld., P. Bost. S.N.H., ii, 197; U.S. Expl. Ex., xii, 91, f. 105, *a*, *b*. *Diplommatina* (*Paxillus*) *peregrina*, Gld.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 620; Suter, J. de Conch., xli, 223.

Shell small, sinistral, elongated, subfusiform, solid, opaque, rufous-cinereous, hardly striated, perforated. *Spire* mamillated at the apex.

Whorls 8, flattened, subtabulated. *Suture* linear, deep. *Aperture* subquadrate. *Peristome* entire, equal, slightly reflexed.

Diameter, 2·5 mm.; height, 10 mm.

Type in the U.S. Nat. Museum, Washington.

Hab.—New Zealand (U.S. Expl. Ex.).

Remark.—Like the foregoing, this species has not been found again.

Fam. **LITORINIDÆ**, Gray.

Animal having the proboscis wide and short; tentacles long, cylindrical, with eyes on small swellings at their outer bases; foot anteriorly truncate. Intromittant organ well developed, behind the right tentacle; reproduction oviparous or ovoviviparous. Radula long and narrow, formula 2+1+1+1+2. Central tooth of variable size, with a few short denticles; lateral and marginal teeth in oblique rows, the lateral tooth large, tricuspid, marginals arcuate and denticulate.

Distribution.—World-wide.

Key to Genera.

A. Shell imperforate, solid; outer marginals of radula with 3 denticles .. .. Litorina.
B. Shell rimate, chitinous, fragile; outer marginals of radula multidenticulate .. .. Lævilitorina.

Genus 1. Litorina, Menke, 1828.

Litorina, Menke, Syn. Meth. Moll., 1828. Type: *L. littorea*, L. *Litorina*, Menke: Ad., G.R.M., i, 312; Fischer, Man. de Conch., 707; Tryon, Man. Conch. (1), ix, 229; Conch. Icon., x.

Animal having the foot obtuse behind, longitudinally divided, so that in walking each side advances alternately; there are no appendages. Intromittant organ flat and rugose. The lingual ribbon is very long, with a large number (up to 600) of rows of teeth.

Shell imperforate, turbinate, coloured; aperture rounded, not notched below, the outer lip not thickened; columella flattened or excavated; operculum horny, paucispiral; nucleus more or less excentric.

The species inhabit the sea, brackish or sometimes even fresh water, and are mostly littoral, feeding on algæ. They are in a great measure amphibious, living on rocks and grasses, where they are washed by the high tide; they will consequently withstand deprivation of water for a period.

Some of the species are the food of man in Europe, and they are also extensively gathered for bait. The best-known species, *L. littorea*, is very abundant on the coasts of northern Europe; 1,900 tons of this mollusc are sold annually in the London market, employing a thousand

persons in gathering it. It is extensively distributed by English fishermen over the oyster-beds, in order to keep them clear of seaweed.

Vernacular Name.—Periwinkle.

About 150 species have been generally admitted, inhabiting all parts of the globe.

Fossil they are rather numerous, commencing with Secondary forms; there are also some older fossils of somewhat problematical position, which may perhaps belong in the family.

Sect. 1. Melaraphe, Muehlfeldt, 1828.

Melaraphe, Mhfdt., in Menke, Synopsis, 1828, 23. Type: *L. scabra*, L.
Littorinopsis, Moerch, 1876, Mal. Blätt., xxiii, 135.

Shell thin, imperforate; spire acuminate, whorls flattened, usually spirally striated, and adorned with coloured markings; aperture effuse anteriorly; columella excavated.

Key to Species.

A. Shell small, banded with white and blue, finely and narrowly spirally striated .. .. *mauritiana.*
B. Shell somewhat larger, brown, with more distant spiral striæ, which are whitish .. .. *cincta.*

1. Litorina cincta, Quoy and Gaimard, 1833. Plate 38, fig. 27.

Litorina cincta, Q. & G., Voy. Astrol., ii, 1833, 481, pl. 30, f. 20, 21; Reeve, Conch. Icon., x, f. 53. *L. angulifera*, Gould, Otia Conch., 1846, 55. *L. luctuosa*, Reeve, Conch. Icon., x, f. 65.

Shell small, ovate-conical, imperforate, solid, slightly glossy, spirally striate. *Sculpture* consisting of very little impressed spiral grooves, the interstices much broader, but narrower on the base, crossed by numerous fine and oblique growth-lines. *Colour* brown, grooves yellowish-white, columella light brown, mouth dark brown, with narrow short yellowish bands on the outer lip, and a broad whitish band below. *Epidermis* rather thin. *Spire* conical, sharply pointed, about the same height as the aperture, outlines slightly convex. *Protoconch* acute, conic, of 3 slightly convex translucent and smooth whorls. *Whorls* 6½, first slowly, then rapidly increasing, moderately convex, the last subangled below the periphery; base flatly rounded. *Suture* well marked. *Aperture* oblique, oval, angled above. *Peristome* sharp, not thickened. *Columella* subvertical, slightly concave, much flattened and excavated below, where it bends off toward the basal lip. *Operculum* of about 3 whorls, nucleus excentric.

Diameter, 9 mm.; height, 13·5 mm. (type). Diameter, 13·5 mm.; height, 20 mm. (large specimen); angle of spire, 46°.

Dentition.—Hutton, T.N.Z.I., xiv, 164. pl. 7, f. D.

Type in the Mus. Hist. Nat., Paris.

Hab.—Throughout New Zealand, but more common in the south. Chatham and Snares Islands.

2. Litorina mauritiana, Lamarck, 1822. Plate 38, fig. 28.

Phasianella mauritiana, Lam., A.s.V., vii, 51. *Litorina mauritiana*, Lam., P.L.S. N.S.W., ix, 942; Man. Conch. (1), ix, 247, pl. 44, f. 71–73, 75; Pritchard and Gatliff, P.R.S. Vic., xiv (n.s.), 90. *L. unifasciata*, Gray, King's "Survey of Australia," ii, App., 483. *L. diemenensis*, Q. & G., Voy. Astrol., ii, 479, pl. 33, f. 8–11. *L. acuta*, Menke, Moll. Nov. Holl., 9, No. 24. *L. coerulescens*, Lam.: Hutton, M.N.Z.M., 79, not of Lamarck. And a good many more synonyms.

Shell small, ovate-conic, imperforate, moderately solid, very often much eroded. *Sculpture* consisting of regular fine and shallow spiral grooves, more distant below the suture and subobsolete on the base; crossed by irregular oblique growth-striæ and folds. *Colour:* Apex brown, the succeeding whorls with the upper half white, the lower blue, the last whorl white with a peripheral blue band; mouth and columella brown. *Spire* acute, conical, about the same height as the aperture, outlines slightly convex. *Protoconch* acutely conical, of 3 smooth, brown, flat, and polished whorls. *Whorls* 7, first slowly, the last very rapidly increasing, flatly convex, the last angled below the periphery; base flatly rounded. *Suture* not deep. *Aperture* oblique, oval, angled above. *Peristome* discontinuous, sharp. *Outer lip* with a narrow yellowish margin inside. *Columella* oblique, arcuate, broad, and flatly excavated, a very narrow groove on the outside; parietal wall with a thin white callus. *Operculum* normal.

Diameter, 6 mm.; height, 9·5 mm. Diameter, 6·5 mm.; height, 12 mm.: angle of spire, 43°.

Dentition.—Hutton, T.N.Z.I., xiv, 164, pl. 7, f. E.

Type in the Mus. Hist. Nat., Geneva.

Hab.—Common on rocks at and above high-water mark throughout New Zealand and at the Chatham Islands; Lord Howe Island, Tasmania, Australia, Mauritius, Ceylon, Nicobars, Malay Archipelago.

Genus 2. Lævilitorina, Pfeffer, 1886.

Lævilitorina, Pfeffer, Jahrbuch Hamburg. Wissensch. Anst. iii, 1886, 81. Type: *Hydrobia caliginosa*, Gould.

A genus distinguished from *Litorina* by the multidenticulate outer marginal teeth of the radula.

Shell chitinous, scarcely chalky, fragile, rimate. *Peristome* thin, sharp, the extremities united by a thin callus. *Epidermis* smooth.

Distribution.—Antarctic Sea.

Key to Species.

A. Shell turbinate.
  a. Last whorl with two spiral bands. .. .. .. *bifasciata.*
  aa. Without spiral bands.
    b. Spire slightly higher than the aperture .. .. *caliginosa.*
    bb. Spire a little lower than the aperture .. .. *antipodum.*
B. Shell subglobose, last whorl very large .. .. .. *Hamiltoni*

1. **Lævilitorina antipodum,** Filhol, 1880. Plate 35, fig. 9.

Assiminea antipodum, Filh., Compt. Rend., xci, 1094; Miss. I.C., 1885, 523.

Shell small, turbinate, rimate, smooth, rather fragile. Oblique fine growth-lines form the only *sculpture*. *Colour* black, olive-brown, or horn-colour. *Epidermis* thin, dull or very slightly shining. *Spire* conical, a little lower than the aperture, outlines convex. *Protoconch* small, globose, of $1\frac{1}{2}$ smooth, convex, and polished whorls, mostly eroded. *Whorls* 5, first slowly, then rapidly increasing, convex; base rounded. *Suture* deep. *Aperture* broadly oval, oblique, angled above. *Peristome* discontinuous, but margins connected by a parietal callus, sharp, not thickened. *Basal lip* very slightly reflexed. *Columella* oblique, arcuate, brown, with a moderate white inner callus. There is a narrow umbilical chink, present also in young specimens. *Operculum* with the nucleus near the inner margin.

Diameter, 2·3 mm.; height, 4 mm. (type). Diameter, 2·9 mm.; height, 4·5 mm. (specimen in my collection).

Dentition.—Similar to that of *L. caliginosa*.

Type in the Mus. Hist. Nat., Paris.

Hab.—Campbell Island (Filhol, Dr. L. Cockayne); Auckland Islands (Professor H. B. Kirk).

2. **Lævilitorina bifasciata,** n. sp. Plate 35, fig. 10.

Shell small, subperforate, globosely ovate, smooth, dark brown with two yellowish bands. *Sculpture* consisting of dense, retractive, and slightly sinuous incremental lines. *Colour* dark- or greenish-brown, the last whorl with a narrow and inconspicuous yellowish spiral band below the suture, and a broader and more distinct band on the base. *Epidermis* thin, waxy. *Spire* conic, its height about $\frac{3}{4}$ that of the aperture. *Protoconch* broadly rounded, smooth. *Whorls* $3\frac{1}{2}$, convex, the last large; base flattish. *Suture* deeply impressed. *Aperture* higher than broad, ovate, vertical, angled above, rounded at the base. *Peristome* thin and sharp, the margins connected by a thin callus over the parietal wall. *Columella* subvertical, slightly arcuate. *Inner lip* a little reflexed, forming a narrow umbilical chink. *Operculum* thin, horny, light-yellowish, paucispiral.

Diameter, 2·8 mm.; height, 3·5 mm.

Radula very similar to that of *L. caliginosa*, the outer marginal tooth with about 12 small denticles.

Type in my collection.

Hab.—Antipodes Islands, together with *Cremnobates parva* (Captain Bollons). Only a few specimens were found.

3. **Lævilitorina caliginosa,** Gould, 1849. Plate 35, fig. 11.

Hydrobia caliginosa, Gld., P. Bost. S.N.H., iii, 83. *Lævilitorina caliginosa*, Gould: Martens and Pfeffer, Jahrbuch Hamburg. Wissensch. Anst., 1886, 81, pl. 1, f. 8; Man. Conch. (1), ix, 254, pl. 46, f. 29. *Littorina caliginosa*, Gould, U.S. Expl. Ex., 198, pl. 14, f. 240. *Hydrobia caliginosa*, Gld.: Smith, Phil. Tr. Roy. Soc., clxviii, 1879, 173, pl. 9, f. 8. *Paludestrina caliginosa*, Gld.: E. A. Smith, P. Mal. S., iii, 22.

Shell small, turbinate, thin and fragile, smooth, dull, rimate. The only *sculpture* fine, microscopic growth-striæ. *Colour* chestnut or olivaceous brown. *Epidermis* thin, not shining. *Spire* elevated conic, a little higher than the aperture, outlines convex. *Protoconch* globose, of 1½ smooth, polished, and convex whorls. *Whorls* 4–5, ventricose, rapidly increasing; base convex. *Suture* deep. *Aperture* oblique, oval, rounded above, flattened on the wall; interior livid or chestnut-coloured. *Peristome* continuous, thin, and sharp. *Columella* oblique, arcuate, but little callous. *Umbilicus* represented by a narrow chink, absent in young specimens. *Operculum* as in *Litorina*.

Diameter, 3·3 mm.; height, 5 mm.

Dentition.—Martens and Pfeffer, *l.c.*, 83, pl. 3, f. 10.

Type in the U.S. Nat. Museum, Washington.

Hab.—Macquarie Island (A. Hamilton). The type is from Royal Sound, Kerguelen Island. Terra del Fuego; South Georgia.

4. **Lævilitorina Hamiltoni,** E. A. Smith, 1898. Plate 35, fig. 12.

Paludestrina Hamiltoni, E. A. Smith, P. Mal. S., iii, 22, f. 1, 2 in text.

Shell very small, subglobose, narrowly umbilicated, smooth, thin and fragile. Incremental striæ form the only *sculpture*. *Colour* fuscous. *Epidermis* thin, not shining. *Spire* short, obtuse. *Protoconch* small, flat, mostly eroded. *Whorls* 3, rapidly increasing, convex, the last predominant; base rounded. *Suture* deep, obsoletely canaliculate. *Aperture* large, roundly ovate, fuscous. *Peristome* continuous, thin, and sharp. *Columella* vertical, long, slightly arcuate, not callous. *Umbilicus* very narrow, a small carina at the base of the area. *Operculum* of 2½ whorls.

Diameter—Maj., 3 mm.; min., 2 mm.: height, 3 mm. (type).

Dentition unknown.

Type in the British Museum.

Hab.—Macquarie Island (A. Hamilton).

Remarks.—This shell recalls in some respects certain forms of the genus *Lacuna*. The dentition being unknown, the generic position is uncertain.

Fam. **RISELLIDÆ,** Kesteven.

The formula of the teeth of the radula is 3 + 1 + 3; the central tooth quadrangular, longer, than broad, with 1 or several cusps; laterals large, with long narrow bases, and bearing usually several cusps.

Shell trochiform or depressed turbinate, solid, periphery angulate or carinate, base more or less concave, perforate or imperforate. Aperture broadly oval or rhomboidal. Peristome sharp, porcellanous inside. Operculum oval, corneous, subspiral, nucleus excentric.

This family includes the genera *Risella*, Gray, and *Risellopsis*, Kesteven.

Distribution.—Australasia.

Genus 1. Risellopsis, Kesteven, 1902.

Risellopsis, Kes., Rec. A.M., iv, No. 7 (25, viii), 1902, 319. Type: *Fossarina varia*, Hutton.

Shell comparatively small, stomatiform or depressed trochoid, perforate, rather solid, spirally ribbed or carinated, growth striate; aperture oval, oblique, interior porcellanous; outer lip sinuated according to sculpture; columella short, curved; operculum corneous, subspiral.

Distribution.—New Zealand, Tasmania, and Australia.

1. Risellopsis varia, Hutton, 1873. Plate 35, fig. 13.

Adeorbis varius, Hutt., C.M.M., 35. *Risella* (?) *varia*, Hutt., J. de Conch., 1878, 27. *Fossarina varius*, Hutt., M.N.Z.M., 79. *Risellopsis varia*, Hutt.: Kesteven, Rec. A.M., iv, 320, f. 30–32 in text.

Shell rather solid, small, opaque with translucent spaces, turbinate, perforate. *Sculpture:* Superiorly there are 2 spiral riblets, the first and smaller at a short distance from the suture, the other median; there are 2 equal-sized riblets on the periphery, the lower of which is seen just above the suture, on the whorls of the spire; upon the base there are 3 equal ribs, and a smaller one around the umbilical tract; oblique dense growth-lines cross the riblets and interstices, more distinct on the base. *Colour* brown, irregularly varied with yellow and grey; umbilical tract white. *Epidermis* solid, not shining. *Spire* conoidal, about the same height as the aperture, outlines slightly convex. *Protoconch* of $2\frac{1}{4}$ whorls, smooth, flatly convex. *Whorls* $4\frac{1}{2}$, first slowly, then more rapidly increasing, rounded; base flatly convex, with concave umbilical area. *Suture* impressed. *Aperture* slightly oblique, broadly oval, interior dark purple with a few white lines. *Peristome* sharp, sinuated by the spiral riblets, margins approximating. *Columella* short, arcuate, white. *Inner lip* reflexed over the narrow perforation, and spreading as a very thin glaze over the parietal wall. *Operculum* horny, oval, subspiral.

Diameter—Maj., 8·5 mm.; min., 7 mm.: height, 4·7 mm.

Dentition.—The central tooth is bluntly unicuspid, base broad. The first lateral with 3 blunt cusps, the middle one broadest; the second has an outer cusp, and ends in a long curved and pointed

blade; the third is a simple elongated blade; all three have long, narrow bases.—Hutton, T.N.Z.I., xiv, 164, pl. 7, f. B; Kesteven, Rec. A.M., iv, 319, fig. 29.

Type in the Dominion Museum, Wellington.

Hab.—Throughout New Zealand and at the Chatham Islands; at and above high-water mark, on rocks, often hiding in clusters of *Modiolus ater*.

Var. **carinata**, Kesteven, 1902. Plate 35, fig. 14.

Risellopsis varia, Hutt., var. *carinata*, Kes., Rec. A.M., iv, 1902, 321, f. 33–35 in text.

Shell depressed trochiform, tabulate. *Sculpture:* Two prominent spiral carinæ divide the shell into a superior, peripheral, and basal area; there are on the superior area 2 small riblets—one (the smaller) at the suture, the other a little less than a third of the breadth of the area from the suture; on the base there are 3 spiral riblets of about equal size, and a smaller one round the umbilical tract. Seen from below, the mouth is somewhat rhomboidal, with one rounded side, the basal margin. *Operculum* and *dentition* as in the species.

Diameter—Maj., 5 mm.; min., 4·3 mm.: height, 3 mm.

Type in the Australian Museum, Sydney.

Hab.—The same as the species.

Remark.—Differs from typical examples in the development of the 2 peripheral keels, to which is due the difference in contour.

Fam. **FOSSARIDÆ**, Fischer.

Animal having the head proboscidiform, with a median longitudinal sulcus; tentacles thread-like, sharp, grooved; eyes at their external base; 2 frontal lobes between the tentacles; foot obtuse at both ends.

Central tooth of the radula with a triangular, finely dentate cusp; lateral tooth transverse, with a strong cusp and a series of fine denticulations its entire length; marginals elongated, simple.

Shell turbinated, rather solid, white, grooved or ribbed spirally; aperture entire; lip simple, undulated; columella nearly straight; operculum corneous, subconcentric or subspiral.

Genus 1. Couthouyia, A. Adams, 1860.

Couthouyia, A. Ad., A.M.N.H. (3), v, 1860, 410. Type: *C. decussata*, A. Ad.

Shell ovate, profoundly and widely rimate; spire acuminated; whorls convex, decussated, with impressed suture; aperture semiovate; inner lip straight, dilated in front; outer lip arcuate, simple.

The type is from Japan. Indian Ocean and Australasia.

Fossil in the Pliocene of New Zealand.

1. **Couthouyia corrugata,** Hedley, 1904. Plate 35, fig. 15.

Couthouyia corrugata, Hedley, Rec. A.M., v, pt. 2, 95, f. 22 in text.

Shell very small, fusiform, thin and fragile. *Sculpture:* Numerous growth-lines cross the whorl irregularly, and assume the aspect of varices; the whorls are crossed by faint, shallow, close, spiral grooves. *Colour* white. *Spire* elevated, conical, about the same height as the aperture, outlines convex. *Protoconch* small, of $1\frac{1}{2}$ convex microscopically obsoletely reticulated whorls. *Whorls* $4\frac{1}{2}$, rounded, constricted at the sutures, last whorl finally free. *Suture* deep. *Aperture* slightly oblique, elliptical. *Peristome* continuous, separated from the body-whorl by a deep groove, thickened and reflected. *Columella* broad and excavate. *Operculum* unknown.

Diameter, 1·55 mm.; height, 2·58 mm. (type).

Animal unknown.

Type in the Australian Museum, Sydney.

Hab.—Foveaux Strait, type (A. Hamilton); Snares, in 50 fathoms (Captain Bollons); near Cuvier Island, in 38 fathoms (Captain Bollons).

Fam. **PLANAXIDÆ**, Adams.

Animal with a rather long rostrum, subulate tentacles and eyes on swellings at their base. Siphon very short; foot simple. Central tooth of radula trapezoid; lateral tooth broad in front, with a few denticles on each side of the cusp, much narrowed at the base; marginals straight, long, finely pectinate.

Shell oval-conic, spire elevated, without varices; columella flattened, truncate anteriorly; lip rounded, simple, notched in front; operculum corneous, subspiral.

Genus 1. Planaxis, Lamarck, 1822.

Planaxis, Lam., A.s.V., vii, 50. Type: *P. sulcatus,* Born.

Shell imperforate, oval-conic, solid, with epidermis, and elevated spire, usually spirally sulcate; columella callous, flattened, truncate at base, with a narrow sinus; interior of aperture ridged, base notched; operculum paucispiral, with a nearly terminal nucleus.

Amphibious, crawling on stones near the margins of pools left by the retiring tide, or adhering to mangrove-roots.

About fifty species are known, tropical or subtropical.

Fossil in the Pliocene of the West Indies.

Sect. 1. Hinea, Gray, 1847.

Shell smooth, covered by an epidermis; whorls flattened; outer lip thickened, and grooved within.

1. **Planaxis brazilianus**, Lamarck, 1822. Plate 38, fig. 29.

Buccinum brasilianum, Lam., A.s.V., vii, 272. *Planaxis brazilianus*, Lam.: Hedley, P.L.S. N.S.W., 1904, 186; Conch. Icon., xx, f. 35. *P. mollis*, Sowerby, Gen. of Shells, pt. 12, pl. 219, f. 2; Man. Conch. (1), ix, 279, pl. 52, f. 34, 35; Suter, T.N.Z.I., xxxviii, 328. *Buccinum lævigatum*, Wood, Index Test., sup. 13, pl. 4, f. 29*a*. *Planaxis pigra*, Forbes, P.Z.S., 1850, 273, pl. 11, f. 5. *P. fulva*, A. Ad., P.Z.S., 1851, 271. *P. mollis*, Sow.: Pritchard and Gatliff, P.R.S. Vic., xiv (n.s.), 87.

Shell small, oval-conic, solid, imperforate. *Sculpture* consisting of a few narrow grooves at the base around the neck. *Colour* yellow or yellowish-brown. *Epidermis* minutely pilose, dull, mostly worn off on the upper whorls. *Spire* elevated conical, a little higher than the aperture, outlines straight. *Protoconch* small, conic and obtuse, of 2 smooth white whorls. *Whorls* 7, first regularly, then rapidly increasing, flatly convex, the last rapidly descending on approaching the aperture; base slightly concave. *Suture* not impressed. *Aperture* oblique, oval, with a narrow sinus at the base. *Outer lip* rounded, much thickened inside by a white, shining, and grooved callus. *Columella* slightly oblique, moderately excavated. *Inner lip* forming a white rounded callosity, which spreads over part of the body and is connected with the outer lip. *Operculum* normal.

Diameter, 7 mm.; height, 14 mm. (Kermadec specimen).

Animal unknown.

Type in the Mus. Hist. Nat., Geneva.

Hab.—Bay of Islands; Kermadec Islands (Miss Robison). Australia and Lord Howe Island.

Remarks.—The specific name is a misnomer, as this shell does not occur on the coast of Brazil. Personally, I am strongly opposed to the use of such names, but the rule of zoological nomenclature is very clear on this point, and we have to obey it, meanwhile hoping that it may be altered some day.

Fam. **REALIIDÆ**, Kobelt and Moellendorff.

Shell small, variously shaped; operculum oval, horny, cartilaginous or calcareous, having an excentric nucleus and few whorls.

Distribution.—Indo-Pacific.

Subfam. REALIINÆ.

Realiinæ, Kobelt, "Synopsis der Pneumonopomen-Familie Realiidæ," in Jahrb. Nassau. Ver. f. Naturk., lix, 1906, 45.

Shell small, turriculate, globosely turriculate or conoidal; operculum horny.

This subfamily includes the five genera—*Realia*, Gray; *Omphalotropis*, L. Pfeiffer; *Acmella*, Blanford; *Cyclomorpha*, Pease; and *Dacrystoma*, Crosse and P. Fischer.

Distribution.—Madagascar to New Zealand and Tahiti.

KEY TO GENERA.

1. Peristome continuous, double .. .. .. REALIA.
2. Peristome discontinuous, straight or expanded, a more or less distinct keel round the umbilicus .. .. OMPHALOTROPIS.

Genus 1. REALIA, Gray, 1850.

Realia, Gray, P.Z.S., 1849 (1850), 167. Type: *R. egea*, Gray. *Realia*, Gray: Hedley and Suter, P.L.S. N.S.W. (2), vii, 622; Suter, J. de Conch., xli, 225; Kobelt, Jahrb. Nassau. Ver. f. Naturk., lix, 49. *Liarea*, Gray. Cat. Phaneropn. Br. Museum, 1852, 217.

Animal having the tentacles long, cylindrical; eyes at the outer base; mouth proboscidiform; foot elongate, tapering posteriorly. There are no jaws. Radula with multicuspidate teeth.

Shell small, turriculate, smooth or longitudinally plicate, the last whorl angled to keeled; aperture oval; peristome continuous, double; operculum thin, horny, paucispiral.

Distribution.—New Zealand (North Island only).

KEY TO SPECIES.

A. Suture margined.
   a. Height, 7 mm. .. .. *carinella.*
   aa. Height, 9 mm. .. .. *Hochstetteri.*
B. Suture simple, not margined.
   a. Whorls $6\frac{1}{2}$, the last angled .. .. *egea.*
   aa. Whorls 7–$7\frac{1}{2}$, the last indistinctly angled .. .. *turriculata.*

1. Realia carinella, L. Pfeiffer, 1861. Plate 38, fig. 30.

Realia carinella, Pfeiffer, Malak. Bl., viii, 150; Hedley and Suter, P.L.S. N.S.W. (2), vii, 623; Suter, J. de Conch., xli, 226; Kobelt, Jahrb. Nassau. Ver. f. Nat., lix, 50.

Shell perforated, turreted, rather solid. *Sculpture:* The third whorl closely and finely axially striate, the following whorls obliquely striated with small plait-like striæ. *Colour* brown, faintly marbled, or with a few yellowish streaks. *Epidermis* thin, slightly shining. *Spire* elongated, outlines but little convex, a little more than twice the height of the aperture. *Protoconch* slightly bulbose, of 2 smooth convex whorls. *Whorls* 7, a little convex, the last carinated; base slightly convex, with a compressed riblet around the perforation. *Suture* superficial, margined with a thread-like edging. *Aperture* vertical, oval, angulated above. *Peristome* fuscous, double, the internal one continuous, slightly raised; the external flatly spread out, narrowed at the penultimate whorl, but slightly reflexed. *Perforation* very narrow, open. *Operculum* typical.

Diameter, 3·25 mm.; height, 7 mm.

Dentition unknown.

Type in the K.K. Hofmuseum, Vienna.

Hab.—Drury and Taupiri, type (Hochstetter); Tarukenga; Ohaupo; Tuakau; Maketu, Hunua Range; Waitakeri Range (H. S.); Omaha; Whangaroa (C. Cooper); Rawene, Hokianga.

2. **Realia egea,** Gray, 1850. Plate 38, fig. 31.

Realia egea, Gray, P.Z.S., 1849 (1850), 167; Martini and Chemnitz, Conch. Cab., ed. 2, i, 303, pl. 40, f. 17, 18; Hedley and Suter, P.L.S. N.S.W. (2), vii, 622; Suter, J. de Conch., xli, 225, pl. 1, f. 1; Kobelt, Jahrb. Nassau. Ver. f. Nat., lix, 50.

Shell turreted, subperforate, rather solid. *Sculpture* formed by rather distant axial folds. *Colour* brown with a chestnut-brown band upon the base, or yellowish with lighter or darker zigzag lines, or horny with broad whitish bands. *Epidermis* rather thin, the axial folds easily worn off, scarcely shining. *Spire* turreted, twice the height of the aperture. *Protoconch* small, papillate, of 2 smooth and convex whorls. *Whorls* 6½, slightly convex, the last distinctly angled below the middle; base flatly convex, with a low keel round the umbilicus. *Suture* moderately deep, subplicate. *Aperture* somewhat oblique, ovate. *Peristome* double, the inner continuous, very little expanded, slightly angled above; the outer almost interrupted above, dilated, bell-shaped, incurved. *Umbilicus* very narrow, sometimes partly hidden by the peristome. *Operculum* typical.

Diameter, 4 mm.; height, 7·5–8 mm.

Dentition.—Suter, T.N.Z.I., xxiv, 301, pl. 23, f. 57.

Type in the British Museum.

Hab.—Auckland, type (Greenwood); Hunua Range; Waiwera; Hillyer's Creek, near Auckland; Tuakau; Waiheke Island; Wanganui.

3. **Realia Hochstetteri,** L. Pfeiffer, 1861. Plate 38, fig. 32.

Realia Hochstetteri, Pfeiffer, Malak. Bl., viii, 149; Hedley and Suter, P.L.S. N.S.W. (2), vii, 623; Suter, J. de Conch., xli, 227; Kobelt, Jahrb. Nassau. Ver. f. Nat., lix, 51.

Shell perforated, ovately turreted, rather solid. *Sculpture* consisting of fine and close radiate striæ on the third whorl, the succeeding ones distantly axially plaited. *Colour* fuscous, sometimes with a few yellowish streaks. *Epidermis* thin, usually polished. *Spire* convexly turreted, twice the height of the aperture. *Protoconch* depressed globose, of 2 smooth and convex whorls, the last half-turn sometimes radiately striate. *Whorls* 7½, slightly convex, the last below the middle subacutely carinated; base flatly convex, with a small keel around the perforation. *Suture* inconsiderable, bound with a thread-like margin. *Aperture* vertical, ovately rotund, subangulated above. *Peristome* double, the inner one scarcely elevated, the outer one broadly expanded, concentrically striated, narrow and adnate at the contiguous whorl. *Perforation* narrow, open. *Operculum* typical.

Diameter, 4 mm.; length, 9 mm.

Dentition unknown.

Type in the K.K. Hofmuseum, Vienna.

Hab.—Bay of Islands, type (Hochstetter); Whangarei; Dargaville; Broadwood, Hokianga.

4. Realia turriculata, L. Pfeiffer, 1855. Plate 38, fig. 33.

Realia turriculata, Pfeiffer, P.Z.S., 1854 (1855), 304; Hedley and Suter, P.L.S. N.S.W. (2), vii, 622; Suter, J. de Conch., xli, 226; Kobelt, Jahrb. Nassau. Ver. f. Nat., lix. 51.

Shell subperforated, slender, turreted, rather solid. *Sculpture* consisting of close axial striæ, the later whorls with distant fine membranaceous folds, much closer together on approaching the aperture. *Colour* blackish-brown with a lighter basal band, or with alternating dark-brown and yellowish-white streaks, the base brown. *Epidermis* thin, but little shining. *Spire* elongate, obtuse at the apex, more than twice the height of the aperture. *Protoconch* globose, of 2 smooth and convex whorls. *Whorls* 7–7½, moderately convex, the last indistinctly angled; base flatly convex, keel round the umbilicus absent or but slightly indicated. *Suture* impressed, slightly plicate. *Aperture* vertical, angularly oval. *Peristome* continuous, double, the inner one continuous, a little elevated, the outer one narrowly expanded, inflexed. *Perforation* a mere chink, or closed. *Operculum* typical.

Diameter, 3·6 mm.; height, 9 mm. (4 mm. by 8·5 mm. to 5 mm. by 11 mm.).

Dentition.—Hutton, T.N.Z.I., xvi, 174, pl. 11, f. H.

Type in the British Museum.

Hab.—Kakepuku (Hochstetter); Papakura; Whangarei; Kamo; Te Reinga (C. Cooper); Kaihu, Hokianga; Waiwera (H. S.).

Subsp. lepida, Suter, 1904.

Realia turriculata, Pf., subsp. *lepida*, Suter, P. Mal. S., vi, 157.

A most graceful small subspecies, of a much lighter colour and smaller dimensions than the typical form. The chestnut zigzag bands are narrower and less numerous, the spire is more elongate and more acute, its outlines not convex, but straight. The whorls, 7½–8 in number, are more convex, and the suture is deeper.

Shells of a cream tint and the zigzag markings devoid of colour also occur (mut. *albina*, Sut. 1892).

Type in my collection.

Hab.—Forty-mile Bush, near Mauriceville, type (H. S.); Seventy-mile Bush, near Ormondville (Chadwick).

Genus 2. Omphalotropis, L. Pfeiffer, 1851.

Omphalotropis, Pfeiffer, Zeitschr. Malak., v, No. 8, 1851, 176. Type: *O. hieroglyphica*, Fér.

Shell umbilicated or perforated, turreted to globosely turreted, with a more or less prominent keel around the umbilicus; aperture oval; peristome discontinuous, straight or expanded; operculum thin, horny, paucispiral.

Distribution.—Islands of the Indian and Pacific Ocean.

Subgen. Eurytropis, Kob. & Mlldff., 1898.

Shell conically umbilicated, with very prominent umbilical keel, forming a wide semicircle around the umbilicus; mostly brightly coloured, streaked or banded.

1. **Omphalotropis vestita,** L. Pfeiffer, 1855.

Hydrocena (*Omphalotropis*) *vestita*, Pfr., P.Z.S., 1855, 106. *Omphalotropis vestita*, Pfr., Monogr. Pneum. viv., ii, 166; Hedley and Suter, P.L.S. N.S.W. (2), vii, 1892, 622; Suter, J. de Conch., xli, 225; Kobelt, Jahrb. Nassau. Ver. f. Nat., lix, 84.

Shell perforated, oblongly conical, thin, striated and spirally closely ridged, covered with a somewhat fuscous epidermis. *Spire* pyramidical, rather acute. *Whorls* 6, flat, the last armed below the middle with an acute keel, and about the perforation with a second. *Aperture* hardly oblique, subangularly oval. *Peristome* simple, straight, margins converging. *Operculum* fuscous.

Diameter, 3 mm.; height, 5 mm.; length of aperture, 2 mm.

Type in the British Museum.

Hab.—New Zealand (ex coll. *Cumingiana*).

Remark.—This species has never been found again, and it is doubtful whether the type was really found in New Zealand.

Fam. **RISSOIDÆ**, Gray.

Animal with a more or less elongated muzzle; elongated cylindrical tentacles, with the eyes on swellings at their outer bases; verge exserted, situated at a considerable distance behind the right tentacle; gills both pallial, the right one largest, rather short and broad, composed of few laminæ, which are much broader than high; epipodial filaments present; 1 or 2 pallial tentacles; foot oblong, punctate in front, rounded or pointed behind. Operculigerous lobe well developed. Jaws oval, reticulated. Dentition 2+1+1+1+2.

Shell small, usually turbinate or elongate, often more or less umbilicated; peristome continuous, more or less rounded, never truly channelled in front; operculum corneous, paucispiral.

The *Rissoidæ* are small, often minute, phytophagous animals of marine habitat, found in all parts of the world, frequenting algæ, zostera, &c., from which they often suspend themselves by a mucous filament.

Key to Genera.

A. Aperture entire, oval, peristome thick, simple or reflected; operculum corneous, paucispiral	Rissoa.
B. Aperture semilunar, mostly a little reflected, anteriorly effuse or faintly channelled; operculum corneous, with a claviform process on the internal face ..	Rissoina.
C. Aperture separated from the body-whorl	Amphithalamus.
D. Shell scalariform, with a carinated shoulder	Anabathron.
E. Shell depressed, orbicular, umbilicated; operculum with a large process, vertical to the nucleus	Skenella.

Genus 1. Rissoa, Fréminville, 1814.

Rissoa, Frém., Nouv. Bull. Soc. Ph., vii, 1814. Type: *P. ventricosa*, Desmarest.

Animal having long, slender tentacles, sometimes ciliated, with eyes on small prominences near their outer bases; mantle with a tentacular appendage in front, on the right side, or on either side; foot truncate in front, attennated behind, with a glandular sulcus on its lower side; operculigerous lobe with a wing-like expansion on either side, with 1 to 3 posterior filaments. Radula with the central tooth subquadrangular, multicuspidate, base broadened, incised and lobed laterally; lateral and marginal teeth multicuspidate.

Shell imperforate or subperforate, more or less oblong, turbinated, usually thick, white or corneous, smooth, ribbed or cancellated; aperture entire, oval; peristome thick, simple or reflected; operculum corneous, paucispiral.

Over 400 species have been made known to science. From their minute size it is certain that a good many are synonyms; but, on the other hand, it is probable that many more remain to be described.

They inhabit all seas, from high water to about 1,100 fathoms, some species, therefore, belonging to the abysmal fauna. They abound most in shallow water, near shore, on beds of seaweed.

The animal is active and bold, floats about, and spins a byssal thread instantly upon being detached from its foothold. The incessant play of the tentacular ciliæ is very striking. The epipodial filaments probably are, like the tentacles, tactile in function.

There are a few Secondary species, but the genus is principally found fossil in Tertiary beds.

Vernacular Name.—Spire-shell.

Key to Subgenera.

A. Shell ribbed—*i.e.*, the striking features are axial ribs .. Rissoa, s.s.
B. Shell reticulated—*i.e.*, ribs and spirals pretty equal in strength .. Alvania.
C. Shell strongly spirally lirate—*i.e.*, the spiral threads being the striking feature .. .. Onoba.
D. Shell weakly spirally lirate—*i.e.*, there are spiral threads, but they are not strong .. .. Ceratia.
E. Shell with flat and smooth whorls .. .. .. Cingula.
F. Shell with rounded and smooth whorls .. .. .. Setia.

Subgen. 1. Rissoa, s. str.

Shell elongated conic, axially costate; *aperture* oblong, with a thickened peristome bearing an exterior rib.

Key to Species.

A. Shell with spiral sculpture.
  a. A spiral groove below the suture, costæ extending over the base *impressa.*
  aa. A spiral thread on the periphery of the body-whorl, stopping the axial costæ .. .. *Hamiltoni.*
B. Shell without spiral sculpture.
  a. Shell oval, riblets obsolete on the base, spire twice the height of the aperture .. .. *Huttoni.*
  aa. Shell elongate, riblets extending over the base, spire $2\frac{1}{2}$ times the height of the aperture. .. .. .. *rufoapicata.*

1. **Rissoa Hamiltoni,** Suter, 1898. Plate 12, fig. 1.

Rissoa Hamiltoni, Suter, P. Mal. S., iii, 2, f. 4 in text.

Shell minute, ovate, rimate, costate. *Sculpture* consisting of rather distant rounded axial riblets, about 14 on the last whorl; they are stopped on it by a spiral thread starting from the suture, leaving the base smooth; interstices broader than the riblets, smooth. *Colour* dirty-white or cinereous; there is sometimes a rufous band encircling the upper whorls above the suture, and extending on the body-whorl to within a short distance from the peristome. *Spire* elevated conic, about twice the height of the aperture, outlines slightly convex. *Protoconch* papillate, brownish, of $1\frac{1}{2}$ smooth and convex whorls. *Whorls* 6, regularly increasing, convex; the base flatly rounded. *Suture* impressed, margined by a fine thread. *Aperture* vertical, rotundly ovate. *Peristome* continuous, sharp. *Columella* oblique, rufous, rather concave, subtruncate at the base. *Umbilicus* marked by a very narrow chink. *Operculum* unknown.

Diameter, 1·5 mm.; height, 2·5 mm.

Dentiton unknown.

Type in my collection.

Hab.—Lyall Bay, in sand, type (A. Hamilton); Titahi Bay (Miss Mestayer); Foveaux Strait; Maloney's Reef, Hauraki Gulf (H. S.). Banks Peninsula (Iredale).

Remark.—In young specimens the riblets extend over the base.

2. **Rissoa Huttoni,** Suter, 1898. Plate 12, fig. 2.

Rissoa nana, Hutton, C.M.M., 28, not of Philippi. *R. Huttoni*, Suter, P. Mal. S., iii, 2. *Barleeia nana*, Hutt., M.N.Z.M., 81.

Shell very small, oval, imperforate, costate, white. *Sculpture* consisting of equidistant axial rounded riblets, about 25 on the penultimate whorl, usually getting obsolete below the periphery of the last whorl; interstices of about the same width as the riblets, smooth. *Colour* white or yellowish. *Spire* elevated conic, higher than the aperture, outlines slightly convex. *Protoconch* small, papillate, of $1\frac{1}{2}$ smooth convex and polished whorls. *Whorls* 5, regularly increasing, convex; base rounded. *Suture* impressed. *Aperture* ovate, angled above. *Peristome* continuous, somewhat thickened. *Basal lip* slightly expanded. *Columella* arcuate, but little expanded. *Umbilical area* with a small narrow impression. *Operculum* unknown.

Diameter, 1·25 mm.; height, 2·5 mm.

Dentition not known.

Type in the Dominion Museum, Wellington.

Hab.—Stewart Island (type); Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons); Otago Heads, dredged (A. Hamilton); Whangaroa Harbour (C. Traill); near the Snares, in 50 fathoms (Captain Bollons).

3. Rissoa impressa, Hutton, 1885. Plate 12, fig. 3.

Rissoa impressa, Hutton, T.N.Z.I., xvii, 1884 (1885), 321; Plioc. M., 64, pl. 8, f. 64; Suter, T.N.Z.I., xxxix, 257. *Rissoina agrestis*, Webster, T.N.Z.I., xxxvii, 1904 (1905), 279, pl. 10, f. 10.

Shell minute, ovate, imperforate, solid, costate, with a distinct groove below the suture. *Sculpture* consisting on the last 3 whorls of rather stout rounded axial riblets, about 20 on the last whorl, extending over the base; they are slightly oblique on the upper whorl, but distinctly so on the body-whorl, directed backwards; the interstices are slightly narrower and smooth; the riblets are crossed by a distinct groove a little below the suture, and usually of the same depth as the latter, reducing the riblets between suture and groove to flat nodules; the protoconch is microscopically minutely reticulated, the fine spirals distinct. *Colour* of a purple-brown, shading to cream colour on the body-whorl. *Spire* elevated conic, about twice the height of the aperture; outlines slightly convex. *Protoconch* of 2 convex whorls, dome-shaped. *Whorls* 5, the last 2 rather rapidly increasing, flatly convex; base rounded. *Suture* not much impressed. *Aperture* roundly ovate. *Peristome* continuous, thickened, slightly expanded, with a sharp edge, white and shining. *Columella* short, arcuate, and thick. *Operculum* unknown.

Diameter, 1·2 mm.; height, 2·3 mm.

Animal unknown.

Type, from the Pliocene of Petane, in the Canterbury Museum, Christchurch.

Hab.—Takapuna Reef (W. H. Webster); near Little Barrier Island, in 20 fathoms (R. H. Shakespear); near Channel Island, Hauraki Gulf, in 25 fathoms; Cape Maria van Diemen.

Fossil in the Pliocene of Petane, Wanganui, and Waikopiro.

4. Rissoa rufoapicata, Suter, 1908. Plate 12, fig. 4.

Rissoa rufoapicata, Suter, P. Mal. S., viii, 28, pl. 2, f. 21.

Shell small, elongately oval, rimate, solid, costate, shining. *Sculpture:* The embryonic whorls smooth, the succeeding ones closely axially ribbed, the riblets, first faint and inconspicuous, are getting much stronger as growth proceeds; they are flat, close together, with smooth and slightly narrower interstices, flexuous, nearly vertical on the upper whorls, but obliquely directed backward on the last whorl, and extending over the base. *Colour:* The first 2 or 3 whorls are rufous or purple, the following 2 dark grey, and the last whitish. *Spire* elevated conical, 2½ times the height of the aperture; outlines slightly convex. *Protoconch* papillate, of 2 flatly convex whorls. *Whorls* 6, regularly increasing, flattish; base convex. *Suture* deep, slightly uneven. *Aperture* oblique, oviform, white. *Peristome* continuous, much thickened and expanded. *Columella* very short, arcuate. A distinct *umbilical chink* is formed by the reflection of the inner lip. *Operculum* unknown.

Diameter, 1·9 mm. ; height, 4 mm.

Animal unknown.

Type in my collection.

Hab.—Snares, in 50 fathoms (Captain Bollons).

Remark.—In general appearance this species recalls *Rissoina subfusca*, Hutton, which, however, is quite smooth.

Subgen. 2. Alvania, Risso, 1826.

Alvania, Risso, Hist. Nat. Eur. Mérid., iv, 1826, 146. Type: *R. cimex*, L.
Acinus, Monterosato, 1884.

Shell oval, turbiniform ; spire short, with sharp apex ; whorls rounded, nodulously cancellated ; aperture subcircular, crenulated or grooved within ; outer lip margined exteriorly by a varix.

Key to Species.

A. Spirals not numerous, 3 to 4 on the penultimate whorl.
  a. Penultimate whorl with 3 spirals ; whorls 7 ; spire $2\frac{1}{2}$ times the height of the aperture .. .. .. *cheilostoma.*
  aa. Penultimate whorl with 4 spirals ; whorls $4\frac{1}{2}$; spire little higher than aperture .. .. .. *pingue.*
B. Spirals numerous, more than 4.
  a. Shell elongate, slender ; whorls slightly convex, the last not inflated ; spire $1\frac{1}{2}$ times the height of the aperture .. .. *candidissima.*
  aa. Shell ovate ; whorls strongly convex, the last somewhat inflated ; spire twice the height of the aperture .. *exserta.*

5. **Rissoa candidissima**, Webster, 1905. Plate 12, fig. 5.

Rissoa candidissima, Webster, T.N.Z.I., xxxvii, 1904 (1905), 278, pl. 10, f. 7.

Shell thin, imperforate, semitransparent. *Sculpture :* About 12 distant axial riblets on the body-whorl, crossed by 12 spiral liræ. *Colour* white. *Spire* elevated conic, about $1\frac{1}{2}$ times the height of the aperture ; outlines slightly convex. *Protoconch* of 2 smooth elevated and convex whorls. *Whorls* $4\frac{1}{2}$, slightly convex ; base somewhat flattened. *Suture* deep. *Aperture* vertical, rounded. *Peristome* discontinuous, straight, slightly thickened. *Opercelum* unknown.

Diameter, 1 mm. ; height, 2 mm.

Animal unknown.

Type in Mr. W. H. Webster's collection.

Hab.—Takapuna (type).

6. **Rissoa cheilostoma**, Tenison-Woods, 1877. Plate 12, fig. 6.

Rissoa cheilostoma, T.-Woods, P.R.S. Tasm., 1876 (1877), 152 ; Man. Conch. (1), ix, 366, pl. 68, f. 91. *R. plicata*, Hutton, C.M.M., 29 ; not of Deshayes, 1838. *Rissoina plicata*, Hutt., M.N.Z.M., 80. *Eglisia plicata*, Hutt., P.L.S. N.S.W., ix, 939. *Rissoia plicata*, Hutt. : Suter, P. Mal. S., iii, 6. *R. cheilostoma*, T.-Woods, Pritchard and Gatliff, P.R.S. Vic., xiv (n.s.), 107.

Shell very small, turriculate, imperforate, clathrate, white. *Sculpture* consisting of 2 spiral liræ, increasing to 3 on the penultimate whorl, crossed by rather distant radiate riblets, about 15 on the

penultimate whorl, produced into small nodules at the points of intersection; 3 distinct and smooth spiral riblets upon the base. *Colour* white or yellowish. *Spire* elevated conic, $2\frac{1}{2}$ times the height of the aperture. *Protoconch* papillate, the nucleus slightly tilted, of $1\frac{1}{2}$ spirally striate, strongly convex whorls. *Whorls* 7, regularly increasing, convex, bicarinate at the periphery, shouldered above, flatly receding below; base flatly convex. *Suture* deep, lirate. *Aperture* oblique, oval. *Peristome* continuous, thick, double. *Columella* oblique, arcuate. *Operculum* unknown.

Diameter, 1·5 mm.; height, 3 mm.

Animal unknown.

Type in the Tasmanian Museum, Hobart.

Hab.—Stewart Island, in 18 fathoms (Captain Bollons); Foveaux Strait; Hauraki Gulf; Cape Maria van Diemen; near the Snares and Bounty Islands, in 50 fathoms (Captain Bollons); Dusky Sound, in 30 fathoms (R. Henry); Taumaki Island, South Island, in 10 fathoms (Captain Bollons). The type is from Long Bay, Tasmania. Also recorded from Australia.

Subsp. **Lyalliana**, Suter, 1898.

Rissoa cheilostoma, T.-Woods, subsp. *Lyalliana*, Suter, P. Mal. S., iii, 6.

Shell slightly shorter, less distinctly clathrate, the spiral riblets being much more prominent, and the upper spiral riblet at a greater distance from the suture. Colour cinereous or rufous, occasionally yellowish-white, the base with a broad brown spiral band.

Type in my collection.

Hab.—Lyall Bay, type (A. Hamilton); Titahi Bay (Miss Mestayer); Foveaux Strait; Hauraki Gulf (H. S.).

7. **Rissoa exserta**, Suter, 1908. Plate 12, fig. 7.

Rissoa exserta, Suter, P. Mal. S., viii, 28, pl. 2, f. 22.

Shell small, elongately ovate, imperforate, thin, semitransparent, but faintly shining, strongly axially costate and spirally striate. *Sculpture* consisting of distant, stout, axial riblets with a rather sharp edge, 10 to 11 on the upper whorls, 12 to 14 on the body-whorl, on which they vanish below the periphery; the interstices and the riblets are crossed by distant spiral threads, about 14 on the body-whorl; they are closer together upon the base. *Colour* white, the apex pinkish-brown in fresh examples. *Spire* elevated conical, about twice the height of the aperture; outlines slightly convex. *Protoconch* small, globular, of $1\frac{1}{2}$ microscopically densely spirally striate whorls. *Whorls* 4, the last large in proportion, flattened below the suture, thence strongly convex; base rounded. *Suture* deep. *Aperture* subvertical, oval. *Peristome* continuous, thickened inside, sharp. *Outer lip* with a varix formed by the last axial riblet. *Basal lip* slightly effuse. *Columella* oblique, short, slightly arcuate. *Operculum* unknown.

Diameter, 1·3–1·6 mm.; height, 2·2–2·8 mm.

Animal unknown.

Type in my collection.

Hab.—Snares, in 50 fathoms (type); Bounty Islands, in 50 fathoms (Captain Bollons).

Remarks.—Allied to the Australian *R. devecta*, Tate (=*gracilis*, Angas), which, however, has more numerous axial riblets.

8. Rissoa pingue, Webster, 1906. Plate 12, fig. 8.

Rissoa pingue, Webster, T.N.Z.I., xxxviii, 1905 (1906), 307, pl. 38, f. 7.

Shell very small, oval, minutely clathrate, imperforate. *Sculpture:* Fine spiral lines, 3 on the third and 4 on the penultimate whorl; the spirals are crossed by close-set longitudinal riblets as strong as the spirals, they die out on a level with the posterior angle of the aperture, and the base has 3 spirals only. *Colour* white. *Spire* conical, a little higher than the aperture, outlines convex. *Protoconch* globose, glossy, of $1\frac{1}{2}$ whorls. *Whorls* $4\frac{1}{2}$, regularly increasing, slightly flattened at the periphery; base flatly convex. *Suture* much impressed. *Aperture* oblique, oval, slightly angled above. *Peristome* discontinuous. *Outer lip* thickened externally, especially at the junction with the body, behind which there is a deep groove. *Columella* slightly oblique, arcuate. *Operculum* unknown.

Diameter, 1·25 mm.; height, 2 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms (type).

Subgen. 3. Onoba. H. and A. Adams, 1854.

Onoba, H. & A. Ad., G.R.M., i, 1854, 331. Type: *R. striata*, Montagu.
Turbonilla, Leach, not of Risso.

Shell turbiniform or somewhat elongated; whorls convex, conspicuously spirally striated, sometimes with short longitudinal plicæ at the suture; aperture oval; peristome continuous, thin or slightly thickened.

Key to Species.

A. Body-whorl with 5 broad spirals, no axial sculpture, except growth-lines .. .. *Suteri.*
B. Body-whorl with 4 spirals, and with dense axial foliations .. *foliata.*

9. Rissoa foliata, Suter, 1908. Plate 12, fig. 9.

Rissoa foliata, Suter, P. Mal. S., viii, 28, pl. 2, fig. 23.

Shell minute, turriculate, imperforate, solid, opaque-white, spirally ribbed. *Sculpture:* The first $1\frac{1}{2}$ whorls are microscopically distantly spirally striate; the succeeding whorls have on the upper third a strong spiral cord, and below it 2 smaller ones, the lower of which margins the suture; on the last whorl the whole of this sculpture

is more prominent, and on the base is a fourth cord parallel to the columella; the entire surface is ornamented with dense axial foliations, crenulating the spiral riblets. *Colour* white. *Spire* graduate, much higher than the aperture; outlines very little convex. *Protoconch* conspicuous, globular, of 1½ whorls. *Whorls* 4½, regularly increasing, concave from the suture to the first cord, turned inward in a straight line to the suture below; base convex. *Suture* not much impressed. *Aperture* subvertical, ovate, slightly angled above. *Peristome* continuous, thick, and blunt. *Basal lip* slightly expanded. *Columella* very short, vertical, nearly straight. *Operculum* unknown.

Diameter, 0·8 mm.; height, 2 mm.

Animal unknown.

Type in my collection.

Hab.—Snares, in 50 fathoms (Captain Bollons).

Remarks.—Nearly allied to *R. Suteri*, Hedley, which, however, is much broader, has a smooth protoconch, 2 strong spiral cords on the third whorl, and lacks the foliated axial sculpture.

10. **Rissoa Suteri**, Hedley, 1904. Plate 12, fig. 10.

Rissoa Suteri, Hedley, Rec. A.M., v, 96, f. 23 in text. *R. australis*, T.-Woods: Suter, P. Mal. S., iii, 4, not of T.-Woods. *R. Tenisoni*, Tate, Index, 77, not of Tate.

Shell small, ovate, imperforate, very solid, gradate. *Sculpture*: The third whorl is belted with 2, the fourth with 5 broad spiral flat-topped bands, separated by deep sharp and equally broad interstices. The uppermost band of each whorl is the largest, thence to the base the others gradually diminish. Above the shoulder the concave surface slopes upwards to the suture, and a single small spiral thread interrupts this slope. *Colour* white. *Spire* conical, higher than the aperture; outlines slightly convex. *Protoconch* papillate, of 2 smooth and rounded whorls. *Whorls* 4, rather rapidly increasing, gradate; base convex. *Suture* impressed. *Aperture* oval, oblique. *Peristome* much thickened, externally polygonal from the junction of the spiral ribs, internally duplicated by a small raised rim. *Operculum* unknown.

Diameter, 1·4 mm.; height, 1·8 mm.

Animal unknown.

Type in the Australian Museum, Sydney.

Hab.—Foveaux Strait, type (A. Hamilton); near the Snares, in 50 fathoms (Captain Bollons).

Subgen. 4. Ceratia. H. and A. Adams, 1852.

Ceratia H. & A. Ad., A.M.N.H., x. 1852, 358. Type: *R. proxima*, Alder.

Shell subcylindrical, thin; whorls weakly spirally lirate, flatly convex, with obtuse apex; outer lip thin and sharp.

Animal with flattened, mostly short and claviform tentacles, foot bifurcate posteriorly.

KEY TO SPECIES.

A. Shell subcylindrical; about 10 spirals on the penultimate whorl, insterstices of the same width as the riblets .. *fumata.*

B. Shell elongately oval.

a. About 9 spirals on the penultimate whorl, interstices half the width of the riblets; suture deep .. .. *foveauxiana.*

aa. About 16 spirals on the penultimate whorl; suture impressed .. .. *insculpta.*

11. **Rissoa foveauxiana,** Suter, 1898. Plate 12, fig. 11.

Rissoa foveauxiana, Suter, P. Mal. S., iii, 5, f. 2 in text; Murdoch, T.N.Z.I., xxxvii, pl. 8, f. 27.

Shell minute, ovate, rimate, translucent white. *Sculpture* consisting of close, rather broad and flat spiral striæ, about 9 on the penultimate whorl, crossed by fine growth-lines, interstices about half the width of the liræ. *Colour* white. *Spire* high conical, higher than the aperture, outlines convex. *Protoconch* small, papillate, of 1½ smooth whorls. *Whorls* 5, convex; base rounded. *Suture* deep, but not channelled. *Aperture* subvertical, ovate. *Peristome* continuous, sharp, very little thickened. *Basal lip* but slightly expanded. *Columella* oblique, arcuate, moderately callous. *Umbilical tract* with a narrow chink. *Operculum* unknown.

Diameter, 1·5 mm.; height, 2·5 mm.

Animal unknown.

Type in my collection.

Hab.—Foveaux Strait, in 10–15 fathoms (type); Lyall Bay (Miss Mestayer); Whangaroa Harbour (C. Traill); near the Snares and Bounty Islands, in 50 fathoms, and Taumaki Island, South Island, in 10 fathoms (Captain Bollons); Dusky Sound, in 30 fathoms (R. Henry); Banks Peninsula (Iredale).

12. **Rissoa fumata,** Suter, 1898. Plate 12, fig. 12.

Rissoa fumata, Suter, P. Mal. S., iii, 5, f. 1 in text; Murdoch, T.N.Z.I., xxxvii, pl. 8, f. 26.

Shell minute, subcylindrical, thin, imperforate, translucent. *Sculpture* consisting of numerous fine and close spiral striæ, about 10 on the penultimate whorl, interstices nearly the same width as the liræ. *Colour* white. *Spire* high, narrow, about twice the height of the aperture; outlines slightly convex. *Protoconch* papillate, of 1½ smooth and convex whorls. *Whorls* 5, rather rapidly increasing, moderately convex; base convex. *Suture* impressed. *Aperture* slightly oblique, ovate, angled above. *Peristome* continuous, sharp, slightly thickened. *Basal lip* slightly effuse. *Columella* short, subvertical, but slightly callous. *Operculum* unknown.

Diameter, 1 mm. ; height, 2 mm.

Animal unknown.

Type in my collection.

Hab.—Te Onepoto, near Lyttelton, type (H. S.) ; Lyall Bay and Titahi Bay (Miss Mestayer) ; near the Bounty Islands, in 50 fathoms, and Taumaki Island, South Island, in 10 fathoms (Captain Bollons).

Remark.—The blackish-brown colour of the type specimen was no doubt produced by black mud, in which the specimen had very likely been lying for some time. All specimens I have seen later on were translucent white.

13. Rissoa insculpta, Murdoch, 1905. Plate 12, fig. 13.

Rissoa insculpta, Murdoch, T.N.Z.I., xxxvii, 1904 (1905), 229, pl. 8, f. 28.

Shell small, elongate, slightly rimate, rather fragile. *Sculpture* consisting of minute spiral threadlets, about 16 on the penultimate whorl, and on the last about 25, of which 17–18 are in front of the aperture ; these are crossed by irregular growth-lines, here and there rather pronounced. *Colour* white. *Spire* elevated conical, higher than the aperture ; outlines slightly convex. *Protoconch* small, globose, of 1½ smooth whorls. *Whorls* 5, lightly rounded ; base convex. *Suture* impressed. *Aperture* broadly ovate, slightly oblique, angled above. *Peristome* continuous. *Outer lip* slightly thickened, and projecting from the whorl above. *Operculum* unknown.

Diameter, 1·35 mm. ; height, 2·56 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Whangaroa Harbour, type (C. Traill) ; Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons) ; near the Snares and Bounty Islands, in 50 fathoms, and Taumaki Island, South Island, in 10 fathoms (Captain Bollons) ; Dusky Sound, in 30 fathoms (R. Henry) ; Banks Peninsula (Iredale).

Remarks.—This form is near to *R. foveauxiana,* Sut. It differs in being more slender, more feebly rimate, sculpture much finer, suture less deep, and the whorls less rounded.

Subgen. 5. Cingula, Fleming, 1828.

Cingula, Fleming, Brit. Anim., 1828, 297, 305. Type : *R. cingillus,* Montagu. *Sabinæa,* Leach.

Shell thin, smooth or microscopically spirally striated ; whorls flat, occasionally spotted or banded near the suture ; outer lip sharp, or slightly thickened.

KEY TO SPECIES.

A. Body-whorl with a narrow groove on the periphery, suture channelled .. .. *incidata.*
B. Body-whorl without spiral groove, suture not channelled.
  a. Whorls with microscopic spiral striation.
    b. Protoconch microscopically spirally striate and punctate, suture not margined, colour purplish-red .. *subfusca.*
    bb. Protoconch smooth, sometimes microscopic spirals on the following whorls, suture margined, colour white .. .. *lampra.*
  aa. Whorls without spiral striation.
    b. Shell broadly oval, conical, pink.
      c. Outlines of spire straight, height of shell with 5 whorls 2·3 mm., uniformly pink .. .. *rosea.*
      cc. Outlines of spire somewhat convex, height of shell with 4 whorls 1·5 mm., last whorl with pink bands .. .. *roseocincta.*
    bb. Shell elongately oval, fuscous, with a pale band below the suture .. .. *zosterophila.*

14. Rissoa incidata, Frauenfeld, 1867. Plate 12, fig. 14.

Sabanæa incidata, Frfld., "Novara" Exped., Zool., ii, Moll., 12, pl. 2, f. 19. *Rissoa incidata*, Frfld.; Suter, P. Mal. S., iii, 3; Man. Conch. (1), ix, 339, pl. 63, f. 65; Pritchard and Gatliff, P.R.S. Vic., xiv (n.s.), 103.

Shell minute, conoidal, thick, smooth, brownish. *Sculpture* consisting only of a short spiral groove continued over the body-whorl from the suture; this, however, is sometimes obsolete. *Colour* yellowish-brown. *Spire* conical, higher than the aperture, outlines almost straight. *Protoconch* small, globose, smooth. *Whorls* 5, flattened; base rounded. *Suture* channelled. *Aperture* oval, slightly angled above. *Peristome* discontinuous, much thickened inside, blunt. *Columella* vertical, slightly arcuate, very callous. *Operculum* unknown.

Diameter, 0·8 mm.; height, 1·5 mm.

Animal unknown.

Type in the K.K. Hofmuseum, Vienna.

Hab.—Te Onepoto, near Lyttelton (H. S.); Lyall Bay and Titahi Bay (Miss Mestayer). The type is from Botany Bay, N.S.W. The species is also found in Tasmania.

15. Rissoa lampra, Suter, 1908 Plate 12, fig. 15.

Rissoa lampra, Suter, P. Mal. S., viii, 29, pl. 2, f. 25.

Shell minute, ovate, imperforate, translucent, polished. *Sculpture:* Sometimes a few microscopic distant spiral lines are present on the upper whorls, but usually the surface of the shell is quite smooth. *Colour* white. *Spire* conic, higher than the aperture, the outlines slightly convex. *Protoconch* small, globose, and smooth. *Whorls* 5, slightly convex, the last rounded, but somewhat flattened below the suture; base convex. *Suture* not much impressed, margined below. *Aperture* oval, vertical, angled above. *Peristome* continuous, slightly thickened and expanded. *Columella* short, arcuate. *Operculum* unknown.

Diameter, 0·8 mm. ; height, 1·5 mm.

Animal unknown.

Type in my collection.

Hab.—Titahi Bay, Cook Strait, type (Miss Mestayer).

16. Rissoa rosea, Hutton, 1873. Plate 12, fig. 16.

Rissoa rosea, Hutton, C.M.M., 29. *Barleeia rosea*, Hutton, M.N.Z.M., 81 ; Man. Conch. (1), ix. 393, pl. 71, f. 6 ; Suter, P. Mal. S., iii. 8.

Shell minute, ovate, imperforate, smooth, polished. The only *sculpture* consists of very fine oblique growth-striæ. *Colour* uniformly pink. *Spire* elevated conic, higher than the aperture, outlines straight. *Protoconch* small, globular, of 1½ smooth rounded whorls. *Whorls* 5, regularly increasing, flatly rounded ; base slightly convex. *Suture* moderately impressed. *Aperture* roundly ovate, subangled above. *Peristome* continuous, very little thickened. *Columella* arcuate, vertical, slightly callous, white. *Operculum* unknown.

Diameter, 1·8 mm. ; height, 2·3 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Stewart Island (type) ; Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons) ; Whangaroa Harbour (C. Traill) ; near the Snares and Bounty Islands, in 50 fathoms, and Taumaki Island, South Island, in 10 fathoms (Captain Bollons) ; Dusky Sound, in 30 fathoms (R. Henry) ; Auckland Islands (Professor Benham).

17. Rissoa roseocincta, Suter, 1908. Plate 12, fig. 17.

Rissoa roseocincta, Suter, P. Mal. S., viii, 29, pl. 2, f. 26

Shell minute, ovate, rimate, thin, polished, translucent, with pink and white spiral bands. There is no *sculpture*, except for fine microscopic oblique growth-lines. *Colour :* The first 3 whorls are pink, the last whitish with a narrow pink band below the suture, a second just below the periphery, and a third upon the base ; sometimes the last whorl is also pinkish, and the lighter cinguli are only faintly visible. *Spire* conical, higher than the aperture ; outlines a little convex. *Protoconch* small, broadly rounded, smooth. *Whorls* 4, flatly rounded, the last rather large and somewhat inflated ; base convex. *Suture* not deep. *Aperture* vertical, roundly oval, slightly angled above. *Peristome* continuous in adult specimens, thin on the parietal wall, slightly thickened, sharp. *Columella* short, subvertical ; the inner lip slightly expanded, and giving rise to a narrow chink. *Operculum* unknown.

Diameter, 0·9–1·0 mm. ; height, 1·6–1·5 mm.

Animal unknown.

Type in my collection.

Hab.—Titahi Bay, Cook Strait, type (Miss Mestayer).

Remarks.—The nearly allied *R. rosea*, Hutton, is larger, more solid and opaque, uniformly pink ; the outlines of the spire are straight and the whorls flat.

18. **Rissoa subfusca,** Hutton, 1873. Plate 12, fig. 18.

Rissoa subfusca, Hutton, C.M.M., 28. *R. purpurea*, Hutt., C.M.M., 29: Man. Conch. (1), ix, 344, pl. 71, f. 89. *R. purpurea*, var. *subfusca*, Hutt., *t.c.*, 344. *R. subfusca*, Hutt.: Suter, P. Mal. S., iii, 4.

Shell small, subulately elongated, imperforate, solid, polished. *Sculpture:* The protoconch is microscopically finely spirally striate, the interstices minutely punctate; the following whorls show traces of microscopic spiral striation, otherwise they are smooth; the oblique close and fine growth-lines are distinctly visible under the lens. *Colour* of the upper whorls purple or purplish-red, the last whorl usually of a lighter colour, mostly yellowish; a light band below the suture. *Spire* elevated conic, twice the height of the aperture, outlines straight. *Protoconch* small, globose, of $1\frac{1}{2}$ convex whorls. *Whorls* 6, regularly increasing, flat; base rounded. *Suture* not deep. *Aperture* rounded, subvertical. *Peristome* continuous, much thickened inside, and slightly expanded. *Columella* short, very callous and reflexed. *Operculum* unknown.

Diameter, 1·25 mm.; height, 2·5 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Stewart Island (type); Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons); Foveaux Strait; Cook Strait; Omaha (C. Cooper); near the Snares Islands, in 50 fathoms (Captain Bollons); Dusky Sound, in 30 fathoms (R. Henry). Also Victoria.

Subsp. **micronema,** Suter, 1898.

Rissoa subfusca, Hutt., subsp. *micronema*, Suter, P. Mal. S., iii, 4.

Shell more slender. *Sculpture* of the protoconch the same as in the species; the following whorls are finely spirally lirate; the growth-striæ are oblique, rather distant and prominent, decidedly more so than the spiral sculpture. *Colour* pink or yellowish-pink, the last whorl getting yellowish-white on approaching the mouth. *Spire* subcylindrical, twice the height of the aperture. *Suture* submargined. All the other characters are those of the species.

Diameter, 1·25 mm.; height, 3 mm.

Animal unknown.

Type in my collection.

Hab.—Stewart Island, in 15 fathoms, type (A. Hamilton); Whangaroa Harbour (C. Traill); near the Snares, in 50 fathoms (Captain Bollons); Banks Peninsula (Iredale).

19. **Rissoa zosterophila,** Webster, 1905. Plate 12, figs. 19, *a*, *b*.

Rissoa zosterophila, Webster, T.N.Z.I., xxxvii, 1904 (1905), 277, pl. 9, f. 5. *R. annulata*, Hutton: Suter, P. Mal. S., iii, 3; Index, 77, not of Hutton. *R. zosterophila*, Webst.: Suter, T.N.Z.I., xxxviii, 327.

Shell minute, oval, subrimate, dull, smooth. There is no *sculpture*. *Colour* dark red-brown with a broad milk-white band below the suture, base of the same colour, thus leaving a brown peripheral band on the

body-whorl. *Spire* conical, higher than the aperture; outlines very slightly convex. *Protoconch* globose, small, of 2 convex smooth whorls. *Whorls* 5½ to 6½, rather rapidly increasing, flat, periphery subangled; base rounded. *Suture* not much impressed. *Aperture* slightly oblique, oval, angled above. *Peristome* continuous, but slightly thickened, sharp, very little expanded. *Columella* short, arcuate, callous. *Operculum* colourless, and presenting a malleated appearance on the inner surface (fig. 19*b*).

Diameter, 1 mm.; height, 2·25 mm. The usual height is 2 mm.

Dentition.—Fig. 19*a*.

Type in Mr. W. H. Webster's collection.

Hab.—Devonport, near Auckland, type (W. H. Webster); Hauraki Gulf (H. S.); Cook Strait; Lyttelton, under stones between tidemarks (H. S.); Taumaki Island, South Island, in 10 fathoms (Captain Bollons).

Fossil in the Pliocene. One specimen from Wanganui in my collection.

Var. **minor**, Suter, 1898.

Rissoa annulata, Hutt., var. *minor*, Suter, P. Mal. S., iii, 3.

Smaller than the species, polished, no lighter band below the suture, but the last half-turn of the body-whorl light horn-colour; the whorls are slightly convex, and the suture more impressed.

Diameter, 0·75 mm.; height, 1·5 mm.

Type in my collection.

Hab.—Foveaux Strait, type (A. Hamilton); Banks Peninsula (Iredale).

Subgen. 6. Setia, H. and A. Adams, 1852.

Setia, H. & A. Ad., A.M.N.H., x, 1852, 358. Type: *P. pulcherrima*, Jeffreys.

Shell thin, obovate, oblong or subconic, subumbilicated or imperforate; whorls usually few, rounded and smooth; spire short, apex obtuse; aperture suborbicular, narrowed above; columella somewhat straight; outer lip thin, simple, acute.

Key to Species.

A. Shell with microscopic spiral sculpture.
- *a.* Spire about twice the height of the aperture; shell minute, pupiform; suture margined .. .. .. *lubrica.*
- *aa.* Spire about 1½ times the height of the aperture.
  - *b.* Whorls rounded, suture marginate, imperforate .. *microstriata.*
  - *bb.* Whorls faintly shouldered, suture not margined, rimate .. .. *porcellana.*

aaa. Spire but little higher than the aperture.
- *b.* Spirals on base only, suture margined.
  - *c.* Imperforate, 3 spiral striæ around the umbilical tract, suture subchannelled .. .. *neozelanica.*
  - *cc.* Distinctly rimate, more than 3 spiral striæ on base, suture only impressed .. .. *infecta.*
- *bb.* Spirals on the whole of the body-whorl, suture not margined .. .. *stewartiana.*

B. Shell without microscopic spiral sculpture.
  a. Spire nearly twice the height of the aperture; shell subcylindrical, suture margined .. .. .. *leptalea.*
  aa. Spire about 1½ times the height of the aperture: shell oval, suture not margined .. .. .. *micans.*
  aaa. Spire of about the same height as the aperture, or but little higher.
    b. Suture deep, subchannelled.
      c. Shell of 4½ whorls, oval, height 2·3 mm. .. *vulgaris.*
      cc. Shell of 3 whorls, globular, minute, height 1·25 mm... .. .. *atomus.*
    bb. Suture only impressed; shell oval, rimate .. *verecunda.*

20. **Rissoa atomus**, Suter, 1908. Plate 12, fig. 20.

Rissoa atomus, Suter, P. Mal. S., viii, 30, pl. 2, f. 27.

Shell minute, globular, rimate, smooth, translucent, and polished. The only *sculpture* consists of microscopic growth-lines. *Colour* light yellow. *Spire* short, with a blunt apex, very little higher than the aperture; outlines convex. *Protoconch* small, depressed, flatly convex. *Whorls* 3, convex, rapidly increasing, the last volution occupying about four-fifths of the whole height; base rounded. *Suture* deep, sometimes deeply channelled on approaching the mouth. *Aperture* rotundly ovate, angled above. *Peristome* continuous, very little callous, edge rather blunt. *Columella* subvertical, slightly arcuate. *Inner lip* a little reflexed, and producing an umbilical chink. *Operculum* unknown.

Diameter, 1 mm.; height, 1·25 mm.

Animal unknown.

Type in my collection.

Hab.—Bounty Islands, in 50 fathoms (Captain Bollons).

Remarks.—Nearly allied to *R. micans*, Webster, which, however, has 3½ to 4 whorls, and is much less globose; specimens from Hauraki Gulf measure 1·1 mm. by 1·5 mm.

21. **Rissoa infecta**, Suter, 1908. Plate 12, fig. 21.

Rissoa infecta, Suter, P. Mal. S., viii, 31, pl. 3, f. 31.

Shell minute, oval, rimate, translucent, thin, polished. *Sculpture:* A few faint spiral lines are sometimes present below the periphery on the last whorl; growth-lines very fine, oblique or nearly straight. *Colour* light horny. *Spire* conical, a little higher than the aperture; outlines slightly convex. *Protoconch* small, globose, smooth. *Whorls* 4, convex, the last large in proportion; base rounded. *Suture* impressed, narrowly margined below. *Aperture* slightly oblique, oval, angled above. *Peristome* not continuous, not thickened, thin and sharp. *Columella* vertical, nearly straight. *Inner lip* slightly expanded, and forming a thin layer on the parietal wall. The *umbilical chink* is distinct. *Operculum* unknown.

Diameter, 1·1 mm. ; height, 1·6 mm.

Animal unknown.

Type in my collection.

Hab.—Lyall Bay, type (Miss Mestayer) ; near Taumaki Island, west coast of the South Island, in 10 fathoms (Captain Bollons).

22. Rissoa leptalea, Murdoch, 1905. Plate 12, fig. 22.

Rissoa leptalea, Murdoch, T.N.Z.I., xxxvii, 1904 (1905), 228, pl. 8, f. 23, 24.

Shell minute, slender, smooth, subrimate, rather fragile, shining, and semitransparent. *Sculpture* consisting of microscopic growth-lines only. *Colour* white. *Spire* subcylindrical, nearly twice the height of the aperture ; outlines rather convex. *Protoconch* minute. *Whorls* 5 having a somewhat loosely coiled, and those of the spire swollen, appearance. *Suture* impressed and lightly margined. *Aperture* oval-rotund. *Peristome* continuous, broadly expanded. *Columella* short, broad, and also expanded. *Operculum* unknown.

Diameter, 0·66 mm. ; height, 1·94 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Whangaroa Harbour, type (C. Traill).

23. Rissoa lubrica, Suter, 1898. Plate 12, fig. 23.

Rissoa lubrica, Suter, P. Mal. S., iii, 5, f. 3 in text ; viii, 29, pl. 2, f. 24.

Shell minute, elongately oval, pupiform, imperforate, semitransparent, shining. *Sculpture* consisting of very fine and close microscopic liræ, crossed by fine oblique growth-lines. *Colour* white. *Spire* elevated, narrowly conical, twice the height of the aperture ; outlines slightly convex. *Protoconch* small, dome-shaped, microscopically finely spirally striate, of 1½ convex whorls. *Whorls* 4 to 5, rather rapidly increasing, lightly convex ; base rounded. *Suture* not much impressed, margined below by a narrow band. *Aperture* subvertical, oval. *Peristome* continuous, somewhat thickened. *Basal lip* slightly expanded. *Columella* short, arcuate. *Inner lip* distinctly a little reflexed. *Operculum* unknown.

Diameter, 0·6 mm. ; height, 1·75 mm. (type). Diameter, 0·8 mm. ; height, 1·7 mm. (Bounty Island specimen).

Animal unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—Foveaux Strait, in 15 fathoms (type) ; near the Bounty Islands, in 50 fathoms (Captain Bollons).

Remarks.—This species has much the appearance of *R. fumata*, Sut., and *R. leptalea*, Murd., but both are somewhat higher. The former is much more prominently spirally lirate and the suture is not margined, while the latter is quite smooth. It is a very rare shell, only two specimens being known.

24. **Rissoa micans,** Webster, 1905. Plate 12, fig. 24.

Rissoa micans, Webster, T.N.Z.I., xxxvii, 1904 (1905), 277, pl. 9, f. 4.

Shell minute, oval, subrimate, smooth, polished. *Colour* light reddish-brown. *Spire* conical, higher than the aperture, outlines slightly convex. *Protoconch* minute, of 1½ convex and shining whorls. *Whorls* 4, convex; base rounded. *Suture* impressed. *Aperture* circular. *Peristome* discontinuous, but the margins united by a parietal callosity, sharp, not thickened, whitish and semitransparent. *Columella* arcuate, very slightly reflexed. *Operculum* unknown.

Diameter, 1 mm.; height, 1·5 mm.

Animal unknown.

Type in Mr. W. H. Webster's collection.

Hab.—Takapuna, type (W. H. Webster); Maloney's Reef, Hauraki Gulf (H. S.). Hohoura Bay (R. Buddle); near Little Barrier Island, in 20 fathoms (R. H. Shakespear); Titahi Bay, Cook Strait (Miss Mestayer); near the Snares, in 50 fathoms (Captain Bollons).

25. **Rissoa microstriata,** Murdoch, 1905. Plate 12, fig. 25.

Rissoa microstriata, Murdoch, T.N.Z.I., xxxvii, 1904 (1905), 229, pl. 8, f. 25.

Shell minute, ovate-elongate, smooth, and white. *Sculpture* consisting of microscopic dense spiral striæ, broken up into variable lengths by the irregular lines of growth. *Colour* white. *Spire* elevated conic, higher than the aperture, outlines somewhat convex. *Protoconch* minute. *Whorls* 5, somewhat swollen at the periphery, thence gently flattened to the suture above. *Suture* impressed and lightly margined. *Aperture* obliquely broadly ovate. *Peristome* discontinuous, but the margins united by a parietal callus, slightly thickened, and the basal lip somewhat reflected. *Columella* short, a little arcuate, callous, and reflexed. *Operculum* unknown.

Diameter, 1·08 mm.; height, 2·11 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Whangaroa Harbour, type (C. Traill); near the Snares and Bounty Islands, in 50 fathoms (Captain Bollons); Foveaux Strait; Banks Peninsula (Iredale).

Remarks.—This little shell is perhaps near to *Rissoina neozelanica*, Suter, while the sculpture, though microscopic, may be compared with *Rissoa emarginata*, Hutton, a Pliocene form. (Murdoch.)

26. **Rissoa neozelanica,** Suter, 1898. Plate 13, fig. 1.

Barleeia neozelanica, Sut., P. Mal. S., iii, 8, f. 5 in text.

Shell minute, ovate-conical, imperforate, subpellucid, white, thin, smooth, and shining. *Sculpture* consisting of fine oblique growth-lines, and a few (usually 3) spiral striæ around the umbilical area. *Colour* white. *Spire* conical, a little higher than the aperture; outlines

slightly convex. *Protoconch* small, globose, of 1½ smooth and convex whorls. *Whorls* 5–5½, moderately convex; base rounded. *Suture* impressed, slightly channelled, margined by a thin thread; the sutural channel is very often continued on the body-whorl below the periphery. *Aperture* vertical, oval, angled above. *Peristome* discontinuous, sharp, not thickened. *Basal lip* slightly effuse. *Columella* vertical, slightly concave, and callous; a thin callosity on the parietal wall. *Operculum* unknown.

Diameter, 1·5 mm.; height, 2·mm.

Animal unknown.

Type in my collection.

Hab.—Stewart Island, type (A. Hamilton); near the Bounty and Snares Islands, in 50 fathoms, and Taumaki Island, South Island, in 10 fathoms (Captain Bollons); Banks Peninsula (Iredale).

27. Rissoa porcellana, Suter, 1908. Plate 13, fig. 2.

Rissoa porcellana, Suter, P. Mal. S., viii, 30, pl. 2, f. 29.

Shell minute, ovate, rimate, smooth, translucent white, whorls faintly shouldered. *Sculpture* consisting of fine growth-lines, crossed by a few microscopic spiral striæ upon the base. *Colour* white. *Spire* conical, faintly gradate, 1½ times the height of the aperture; outlines but little convex. *Protoconch* small, globose. *Whorls* 4½ convex, slightly shouldered, the last large; base rounded. *Suture* not deep. *Aperture* ovato-rotund, angled above. *Peristome* discontinuous, rather sharp. *Columella* vertical, arcuate. *Inner lip* not expanded, spreading as a thin callosity over the parietal wall. There is a distinct umbilical chink. *Operculum* unknown.

Diameter, 1·3 mm.; height, 1·8 mm.

Animal unknown.

Type in my collection.

Hab.—Near the Snares, in 50 fathoms (Captain Bollons); Dusky Sound, in 30 fathoms (R. Henry); dredged off Otago Heads (A. Hamilton).

28. Rissoa stewartiana, Suter, 1908. Plate 13, fig. 3.

Rissoa stewartiana, Suter, P. Mal. S., viii, 31, pl. 3, f. 30.

Shell minute, ovate, rimate, smooth, and faintly shining. *Sculpture* consisting of fine oblique growth-striæ, crossed on the last whorl by microscopic faint and distant spiral lines. *Colour* light horny; dead shells are whitish. *Spire* conical, a little higher than the aperture; outlines convex. *Protoconch* small, globose, of 1½ smooth, white, and shining whorls. *Whorls* 4½, convex, the last large; base rounded. *Suture* much impressed. *Aperture* oblique, oval, subangled above. *Peristome* continuous, slightly thickened inside, sharp. *Columella*

short, vertical, a little arcuate. A distinct umbilical chink is present. *Operculum* unknown.

Diameter, 1·25 mm.; height, 1·9 mm.

Animal unknown.

Type in my collection.

Hab.—Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons).

29. Rissoa verecunda, Suter, 1908. Plate 13, fig. 4.

Rissoa verecunda, Suter, P. Mal. S., viii, 30, pl. 2, f. 28.

Shell minute, ovate, rimate, solid, slightly shining, smooth. There is no *sculpture* except fine growth-lines. *Colour* very light horny; dead shells are cretaceous. *Spire* conical, very little higher than the aperture; outlines slightly convex. *Protoconch* small, papillate, of 1½ smooth and convex whorls. *Whorls* 4, the last high, lightly rounded; base convex. *Suture* impressed. *Aperture* oblique, oval, angled above. *Peristome* continuous, thickened, with a blunt edge. *Columella* short, arcuate. Inner lip slightly reflexed, forming a narrow umbilical chink. *Operculum* unknown.

Diameter, 1·25 mm.; height, 2 mm.

Animal unknown.

Type in my collection.

Hab.—Near the Snares, in 50 fathoms (type); and Queen Charlotte Sound, in 16 fathoms (Captain Bollons).

30. Rissoa vulgaris, Webster, 1905. Plate 13, fig. 5.

Rissoa vulgaris, Webster, T.N.Z.I., xxxvii, 1904 (1905), 277, pl. 9, f. 3.

Shell minute, oval, rather solid, rimate, smooth, and somewhat shining. *Sculpture* consisting of fine oblique growth-lines. *Colour* pale horny. *Spire* short, conical, of about the same height as the aperture; outlines slightly convex. *Protoconch* small, smooth, and polished. *Whorls* 4½, first slowly, then more rapidly increasing, moderately convex, the last subangled for a short distance in front of the suture; base rounded. *Suture* deep, slightly channelled. *Aperture* oblique, semilunar, angled above. *Peristome* discontinuous, slightly thickened, sharp, somewhat expanded at the base. *Columella* very short, arcuate, rounded. *Inner lip* very little produced over the narrow umbilical chink, spreading as a distinct white callosity over the parietal wall. *Operculum* unknown.

Diameter, 1·25 mm.; height, 2 mm. (type). Diameter, 1·7 mm.; height, 2·3 mm. (specimen in my collection).

Animal unknown.

Type in Mr. W. H. Webster's collection.

Hab.—Waipipi, Manukau, type (W. H. Webster).

Remark.—The type specimen has the last whorl much more flattened at the periphery. The description and figure are after a specimen obtained from Mr. Webster.

Genus 2. Amphithalamus, Carpenter, 1865.

Amphithalamus, Carpenter, A.M.N.H., xv, 1865, 181. Type: *A. inclusa*, Carp. *Scrobs*, Watson, 1886.

Shell pupoidal; peristome duplicated, the inner lip produced forward, with a subbasal space behind it, outer lip joining it posteriorly, suddenly contracted in the adult.

Distribution.—California, Japan, Australasia.

1. Amphithalamus Hedleyi, Suter, 1908. Plate 13, fig. 6.

Amphithalamus Hedleyi, Suter, P. Mal. S., viii, 31, pl. 3, f. 32.

Shell minute, oval, usually spirally sculptured, pinkish or white, imperforate. *Sculpture* consisting of fine spiral lines, distant or close together, with a keeled shoulder, and sometimes a cincture margining the suture below; the shoulder may be ornamented by a few spirals only or by numerous fine spiral threads; very often the sculpture is becoming obsolete or may be absent altogether, the shoulder only slightly angled. *Colour* uniformly pink, mostly yellowish-white near the mouth, but sometimes with a light-coloured band below the suture and the base whitish; white specimens are also met with, on which the spiral sculpture may be pink-coloured. *Spire* conic, with blunt and rounded apex, a little higher than the aperture; outlines convex. *Protoconch* rather large, of 1 flatly convex, smooth whorl, the nucleus large. *Whorls* 3, convex, the last shouldered; base convex. *Suture* canaliculate. *Aperture* oblique, ovato-semilunar, extended beyond the body-whorl, and separated from it by a broad white flat and slightly sunken callosity. *Peristome* very thick and rounded. *Columella* very short. *Operculum* unknown.

Diameter, 0·7 mm.; height, 1·2 mm.

Animal unknown.

Type in my collection.

Hab.—Maloney's Reef, Hauraki Gulf, type (H. S.); Lyall Bay (H. S.); Titahi Bay, Cook Strait (Miss Mestayer).

Remarks.—Mr. Hedley has discovered this species also in Australian waters. With regard to sculpture, this is one of the most variable shells known to me; all intermediate grades between quite smooth and distinctly spirally ridged forms occur, but the peculiarities of the aperture remain constant.

Genus 3. Anabathron, Frauenfeld, 1867.

Anabathron, Frfld., "Novara" Exped., Zool., ii, 1867, 13. Type: *Rissoa contabulata*, Frfld.

Shell very small, oblong, thick, smooth, scalariform, with a carinated shoulder, imperforate; aperture rounded; peristome continuous.

Distribution.—Australasia.

1. **Anabathron gradatum,** Suter, 1908. Plate 13, fig. 7.

Anabathron gradatum, Suter, P. Mal. S., viii, 32, pl. 3, f. 33.

Shell very small, ovate, graduate, rimate, solid, not shining. *Sculpture* consisting of irregular fine axial plications, crossed by fine microscopic spiral striæ. *Colour* white. *Spire* conical, a little higher than the aperture; outlines convex. *Protoconch* small, papillate, of $1\frac{1}{2}$ convex and microscopically finely spirally striated whorls. *Whorls* 4, the last very large, shouldered above, angle not carinated, slightly convex below; base convex. *Suture* impressed. *Aperture* oblique, oval. *Peristome* continuous, slightly thickened and expanded, sharp, thin on the parietal wall. *Columella* short and arcuate. *Umbilical chink* well marked. *Operculum* unknown.

Diameter, 1·6 mm.; height, 2·25 mm.

Animal unknown.

Type in my collection.

Hab.—Snares, in 50 fathoms (Captain Bollons).

Genus 4. Rissoina, d'Orbigny, 1840.

Rissoina, d'Orb., Voy. Amér. Mérid., 1840. Type: *R. Inca*, d'Orb.

Shell rissoiform, ribbed, cancellated or smooth, whorls numerous, apex mamillated; aperture semilunar, lip thickened within, a little reflected, anteriorly mostly effuse or faintly channelled; operculum corneous, thick, semilunar, paucispiral, with a claviform process on the internal face.

The form of the operculum and effuse character of the base of the aperture are distinguishing features of this group.

The species inhabit warm and temperate seas, are world-wide in distribution, and over 100 good species have been characterized.

There are some Secondary and Tertiary species.

Key to Subdivisions.

A. Shell axially costate, with or without spiral striæ, aperture produced .. .. Rissoina.

B. Upper part of shell axially costate, lower part smooth or spirally striate .. .. Mœrchiella.

C. Shell solid, white, polished, smooth or partly striate, outer lip thick .. .. Zebina.

D. Shell smooth, aperture subcircular, peristome simple, not effuse below .. .. Eatoniella.

Sect. 1. Rissoina, s. str.

Shell axially costate, with or without spiral striæ, aperture produced below, without funicular rib on the base.

Key to Species.

A. Shell with fine spiral striæ, spire twice the height of the aperture.

a. Height of shell less than 8 mm.

b. Axial riblets on body-whorl 22 to 25, 6–7 whorls .. *Hanleyi.*

bb. Axial riblets on body-whorl 15 to 16, 7–8 whorls .. *rugulosa.*

aa. Height of shell more than 8 mm. Axial riblets about 14 .. *zonata.*

B. Shell without spiral striæ, spire more than twice the height of the aperture, 5 whorls .. .. *rufolactea.*

1. Rissoina Hanleyi, Schwartz, 1860. Plate 13, fig. 8.

Rissoina Hanleyi, Schwartz, "Familie der Rissoiden," 1860, p. 64, pl. 4, f. 28; Man. Conch. (1), ix, 370, pl. 55, f. 21; Tate, T.R.S. S.Aust., xxiii, 327; Pritchard and Gatliff, P.R.S. Vic., xiv (n.s.), 109. *R. fasciata*, A. Adams: Suter, P. Mal. S., iii, 7, not of Adams. *R. Hanleyi*, Schw.: Suter, P. Mal. S., viii, 32.

Shell small, elongate, imperforate, strong, shining, closely costate. *Sculpture* consisting of close subsinuous and flattish axial riblets, about 22 to 25 on the last whorl, evanescent upon the base; crossed by numerous fine spiral striæ. *Colour* typically milk-white, with two orange-brown bands; but sometimes the shell is entirely white, or with 2 to 5 narrow brown bands on the body-whorl. *Spire* high, conical, about twice the height of the aperture; outlines slightly convex. *Protoconch* small, papillate, of 1½ smooth and convex whorls. *Whorls* 6 to 7, slightly convex, the last a little more than half the total height; base rounded. *Suture* impressed. *Aperture* oblique, semicircular, angled above, faintly channelled on the left side of its base. *Peristome* thickened, slightly expanded, edge blunt. *Columella* oblique, short, truncated. *Inner lip* forming a conspicuous callosity on the parietal wall, which is united with the outer margin. *Operculum* unknown.

Diameter, 2·8 mm.; height, 6 mm. (type, 7 mm.).

Animal unknown.

Type (?).

Hab.—Bay of Islands; Hauraki Gulf (H. S.). Australia, Philippine Islands (type).

Remarks.—Two specimens in the Canterbury Museum, collected by Mr. C. Spencer near Auckland, and determined as *R. fasciata*, A. Ad., by the late Captain Hutton, are undoubtedly *R. Hanleyi*. The New Zealand specimens taken for *R. fasciata* by Angas and Sowerby were no doubt varieties of *R. rugulosa*, which is nearly allied to the former. I am not aware that *R. fasciata* has ever been found in New Zealand waters.

2. Rissoina rufolactea, Suter, 1908. Plate 13, fig. 9.

Rissoina rufolactea, Suter, P. Mal. S., viii, 33, pl. 3, f. 35.

Shell small, elongate, imperforate, solid, opaque, costate, not shining. *Sculpture:* The first 2 whorls are smooth, the succeeding ones axially costate, the riblets thick and rounded, interstices of the same width as the costæ, about 15 on the last whorl, and stopped below the periphery, leaving the base quite smooth; there is no trace of spiral sculpture. *Colour:* The first 3 whorls are rufous with a narrow darker band below the suture, the rest yellowish-white; or the whole shell may be rufous; or with a milk-white peripheral band, the base white. *Spire* elevated, a little more than twice the height

of the aperture; outlines straight. *Protoconch* small, dome-shaped. *Whorls* 5, flatly convex, the last volution high; base convex. *Suture* not deep. *Aperture* oblique, oval, angled above. *Peristome* continuous, slightly thickened, the edge rather blunt, thin on the parietal wall. *Basal lip* slightly expanded. *Columella* oblique, almost straight, very thin. *Operculum* unknown.

Diameter, 1·5 mm.; height, 3·3 mm.

Animal unknown.

Type in my collection.

Hab.—Hauraki Gulf (H. S.).

Remark.—A species allied to *R. rugulosa*, Hutt., but much smaller, and lacking spiral sculpture.

3. **Rissoina rugulosa**, Hutton, 1873. Plate 13, fig. 10.

Rissoa rugulosa, Hutton, C.M.M., 28. *Rissoina rugulosa*, Hutton, M.N.Z.M., 80; Suter, P. Mal. S., iii, 6. *Eulima chathamensis*, Hutton, C.M.M., 23.

Shell small, elongated oval, imperforate, solid, costate. *Sculpture* consisting of oblique rounded axial riblets, obsolete upon the base, 15–16 on the penultimate whorl; interstices a little wider than the riblets, finely spirally lirate, the liræ slightly stronger and more conspicuous on the base. *Colour* yellowish-brown, rarely with a few lighter bands on the 2 lower whorls; or white or yellowish-white, occasionally with a few light-brown spiral bands on the last 2 whorls; apex and base of lighter colour. *Spire* high, conic, much higher than the aperture; outlines slightly convex. *Protoconch* globose, of 2 smooth, convex, and glossy whorls. *Whorls* 7–8, flatly rounded, regularly increasing; base convex. *Suture* impressed. *Aperture* oblique, ovate, angled above and distinctly channelled below the columella. *Peristome* continuous, much thickened, white, rounded. *Columella* very short, oblique. *Operculum* typical.

Diameter, 3 mm.; height, 7·5 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Stewart Island (type); Bay of Islands; Hauraki Gulf; Chatham Islands; Taumaki Island, South Island, in 10 fathoms (Captain Bollons); Banks Peninsula (Iredale).

Remarks.—This species closely approaches *R. Hanleyi*, Schwartz (= *R. variegata*, Angas), *R. lirata*, Angas, and *R. Angasi*, Pease (= *R. turriculata*, Angas), from Australia, but I do not think it is conspecific with any of them. It certainly is distinct from *R. Hanleyi*. Good series of the Australian species are wanted to settle the question, and these are not at my disposal.

The shell is sometimes covered with a black coating.

Fossil in the Pliocene.

4. Rissoina zonata, Suter, 1909. Plate 13, fig. 11.

Rissoina zonata, Suter, P. Mal. S., viii, 1909, 253, pl. 11, f. 1.

Shell rather large, oblong, imperforate, indistinctly axially costate and minutely spirally lirate, body-whorl usually with a brown zone. *Sculpture* consisting of somewhat indistinct axial riblets, about 14 on the last whorl, and very fine microscopic spiral striæ. *Colour* white, usually with a chestnut spiral band, beginning narrowly on the penultimate whorl above the suture and broadening very rapidly on the body-whorl, but leaving the base white. *Spire* high, about twice the height of the aperture; outlines somewhat convex. *Protoconch* with a flat nucleus. *Whorls* about 7, lightly convex and somewhat flattened below the suture; base flattish. *Suture* not much impressed. *Aperture* semicircular, oblique, angled above, channelled below. *Outer* and *basal lip* regularly arched, thick, with a rounded edge. *Columella* very short, slightly twisted, and turned to the left, forming a distinct short channel with the slightly effuse basal lip. *Inner lip* very thick, connecting the margins over the slightly excavated parietal wall. *Operculum* unknown.

Diameter, 4½ mm.; height, 11½ mm. Diameter, 5 mm.; height, 10½ mm.

Animal unknown.

Type in my collection.

Hab.—Bay of Islands (J. C. Anderson).

Remark.—All the specimens at my disposal are beach-worn, and the axial sculpture mostly effaced.

Sect. 2. Mœrchiella, Nevill, 1884.

Mœrchiella, Nevill, Hand List Ind. Mus., 73. Type: *R. gigantea*, Deshayes.

Upper part of shell axially ribbed, lower part smooth or spirally striate.

5. Rissoina carnosa, Webster, 1905. Plate 13, fig. 12.

Rissoia carnosa, Webster, T.N.Z.I., xxxvii, 1904 (1905), 278, pl. 9, f. 6.

Shell very small, elongate-oval, imperforate, thin. *Sculpture* consisting of slightly oblique straight axial riblets, about 20 on the penultimate whorl, absent on the first 2 whorls and getting obsolete on the body-whorl, crossed by fine spiral liræ which diminish in strength toward the apex. *Colour* flesh-brown, with a cream-coloured band above the periphery, some specimens being a darker brown without the band, others having the last whorl entirely cream-coloured. *Spire* elevated conic, higher than the aperture, outlines slightly convex. *Protoconch* of 2 smooth, convex whorls, dome-shaped and dark. *Whorls* 5½, the last proportionately large, slightly convex; base rounded. *Suture* moderately impressed. *Aperture* oblique, oval, angled above; the spiral sculpture plainly visible when looked at

through the aperture. *Peristome* not continuous, thin and sharp, slightly effuse below. *Columella* oblique, nearly straight, but little callous, subtruncate at the base. *Operculum* unknown.

Diameter, 1·3 mm. ; height, 3 mm.

Animal unknown.

Type in Mr. W. H. Webster's collection.

Hab.—Takapuna, type (W. H. Webster) ; Hohoura Bay (R. Buddle).

Sect. 3. Zebina, H. and A. Adams, 1854.

Zebina, H. & A. Ad., G.R.M., i, 1854, 328 Type : *R. lævissima*, C. B. Adams.

Shell white, solid, opaque, polished, smooth or partly striate ; outer lip rather thick, often with 1 or more anterior internal tubercles.

Key to Species.

A. Surface smooth, sometimes with 4 spiral lines at the base ; aperture rounded anteriorly .. .. *Coulthardi.*
B. Surface with microscopic spiral grooves ; aperture truncated at the base .. .. *emarginata.*

6. Rissoina Coulthardi, Webster, 1908. Plate 13, fig. 13.

Rissoina Coulthardi, Webster, T.N.Z.I., xl, 1907 (1908), 258, pl. 21, f. 30–32.

Shell imperforate, milk-white, loosely coiled, especially the last whorl, the aperture and its posterior callosity occupying exactly one-half the entire length of the shell. *Protoconch* minute, shining, colourless. *Whorls* 5, somewhat flat, extremely glossy, the body-whorl with a few longitudinal markings of pale brown ; in some specimens these stripes are transparent. *Suture* shallow. Base of one specimen (not the type) with 4 spiral lines. *Aperture* pear-shaped ; a heavy callus at the juncture with the body, and a partly concealed arch in the angle. *Columella* nearly upright, with a wrinkled twist on the outside of the pillar. *Operculum* unknown. (Webster.)

Diameter, 1·5 mm. ; height, 3 mm.

Animal unknown.

Type in Mr. W. H. Webster's collection.

Hab.—Orua Bay, Manukau Harbour, in 3 fathoms.

I have not seen this species.

7. Rissoina emarginata, Hutton, 1885. Plate 13, fig. 14.

Rissoa emarginata, Hutt., T.N.Z.I., xvii, 1884 (1885), 320, pl. 18, f. 20 ; Plioc. M., 65, pl. 8, f. 68 ; Iredale, T.N.Z.I., xl, 383. *Rissoina parvilirata*, Suter, T.N.Z.I., xxxix, 1906 (1907), 257, pl. 9, f. 5.

Shell small, oblong, imperforate, polished, microscopically spirally lirate, base subtruncate. *Sculpture* formed by close, fine, spiral grooves, visible only under a good lens, the interspaces being broader than the grooves. *Colour* pure-white. *Spire* conical, about $1\frac{1}{2}$ times the height of the aperture. *Protoconch* minute, smooth, globularly

pointed. *Whorls* 5, lightly convex, the last large, occupying nearly three-fourths of the total height, slightly flattened below the suture. *Suture* superficial, submargined above. *Aperture* vertical, pyriform, truncated at the base. *Outer lip* strong, descending nearly straight, then turning at a narrowly rounded angle toward the straight and slightly notched basal lip. *Columella* concave and truncated below. *Inner lip* forming a strong but narrow callus on the body-whorl, broadening above, where it joins the outer lip; on the columella it is much narrower, covering only the inner half of it. *Operculum* unknown.

Diameter, 1·5 mm.; height, 3 mm.

Type, from the Pliocene, in the Canterbury Museum, Christchurch.

Hab.—Near Channel Island, Hauraki Gulf, in 25 fathoms; near Little Barrier Island, in 20 fathoms (R. H. Shakespear); near Cuvier Island, in 38 fathoms (Captain Bollons); Queen Charlotte Sound, in 16 fathoms (Captain Bollons); off Otago Heads, dredged (A. Hamilton); Purau, Lyttelton Harbour, and Lyall Bay (Iredale).

Fossil in the Pliocene.

Subgen. 1. Eatoniella, Dall, 1876.

Eatoniella, Dall, Bull. U.S. Nat. Mus., iii, 1876, 42. Type: *R. kerguelensis*. Smith. *Eatonia*, E. A. Smith, 1875; not of Hall, 1857.

Shell smooth, aperture subcircular, peristome simple, continuous, not effuse below, lip-margin not thickened; operculum paucispiral, with an interior claviform process.

Key to Species.

A. Spire but little higher than the aperture; shell thin, pellucid, microscopically very finely spirally striate .. .. *cuvieriana*.
B. Spire about 1½ times the height of the aperture.
  a. Shell with white spots and zigzag lines below the suture; rimate .. .. *limbata*.
  aa. Shell without any colour-markings, black; not rimate .. *Chiltoni*.
C. Spire about twice the height of the aperture.
  a. Shell fairly solid, opaque, peristome lightly thickened .. *olivacea*.
  aa. Shell thin, semitransparent, with a brown band below the suture; peristome thin and sharp .. .. .. *fuscozona*.

8. Rissoina Chiltoni, Suter, 1909. Plate 13, fig. 15.

Rissoina Chiltoni, Suter, Subantarct. Islds. N.Zeal., i, 1909, 18, pl. 1, f. 2.

Shell minute, elongated conic, imperforate, rather solid, smooth, black. There is no *sculpture;* the surface in most specimens much corroded. *Colour* black, peristome white, interior of aperture bluish-black. *Spire* conic, obtuse, its height about 1½ that of the aperture; outlines straight. *Protoconch* somewhat globular. *Whorls* 5, regularly increasing, very lightly convex; base rounded. *Suture* not much

impressed. *Aperture* subvertical, oval, angled above. *Peristome* continuous, simple, straight and sharp, very little callous inside. *Columella* short, arcuate. *Inner lip* slightly expanded towards the very slight umbilical depression. *Operculum* horny, rather thin, with an oblique claviform inner process.

Diameter, 1·5 mm. ; height, 2·7 mm. (type).

Dentition.—Central tooth rhomboidal, with 5 denticles, the mesial larger than the others. Lateral tooth elongated, with a broad short reflection and 5 small cutting-points, the middle one largest. First marginal with 3 subequal denticles, the second with 2 sharp minute hooks at the apex, the upper one with a number of very small cutting-points.

Type in the Canterbury Museum, Christchurch.

Hab.—Campbell Island, type (Professor Chilton) ; Auckland Islands (Captain Bollons). Specimens from the latter locality are also in the British Museum.

9. Rissoina cuvieriana, Suter, 1908. Plate 13, fig. 16.

Rissoina cuvieriana, Suter, T.N.Z.I., xl, 1907 (1908), 345, pl. 27, f. 3.

Shell small, ovate, imperforate, thin and fragile, pellucid, somewhat shining. *Sculpture* consisting of very fine oblique growth-lines, crossed by microscopic fine and close spiral striæ, very faint on the spire-whorls. *Colour* yellowish-brown, with a darker band below the suture and upon the umbilical tract. *Spire* conical, slightly higher than the aperture ; outlines almost straight. *Protoconch* small, whorls convex and smooth. *Whorls* 6, convex, the last of considerable size ; base rounded. *Suture* not much impressed. *Aperture* oblique, oval, angled above, distinctly effuse below. *Peristome* discontinuous, simple, sharp. *Columella* vertical, somewhat concave, white. *Inner lip* not reflexed, with a sharp edge, spreading as a thin white callosity over the parietal wall. *Operculum* unknown.

Diameter, 3·5 mm. ; height, 5·8 mm.

Animal unknown.

Type in my collection.

Hab.—Five miles south of Cuvier Island, in 38 fathoms (Captain Bollons). One specimen.

Remark. — In coloration this species resembles the much smaller *R. fuscozona*, Sut.

10. Rissoina fuscozona, Suter, 1908. Plate 13, fig. 17.

Rissoina fuscozona, Suter, P. Mal. S., viii, 32, pl. 3, f. 34.

Shell small, elongately oval, imperforate, thin, smooth, shining, semitransparent. Fine oblique growth-lines form the only sculpture. *Colour* fulvous, a dark-brown band below the suture, peristome fuscous. *Spire* elevated conic, twice the height of the aperture ; outlines

slightly convex. *Protoconch* small, flatly convex, smooth. *Whorls* 5, convex, regularly increasing, the last high, rather ventricose and slightly contracted below; base convex. *Aperture* oblique, oval, angled above. *Peristome* continuous, not thickened. *Basal lip* slightly expanded. *Columella* oblique, a little arcuate, subtruncate. *Inner lip* but little reflexed. *Operculum* unknown.

Diameter, 1·7 mm.; height, 2·8 mm.

Animal unknown.

Type in my collection.

Hab.—Hohoura Bay (Roger Buddle).

11. **Rissoina limbata**, Hutton, 1883. Plate 13, fig. 18.

Cingula limbata, Hutt., N.Z.J.S., i, 477; T.N.Z.I., xvi. 214. *Rissoa limbata*, Hutt., P.L.S. N.S.W., ix, 941. *R. (Setia) limbata*, Hutt., Man. Conch. (1), ix, 355, pl. 71, f. 98. *Phasianella limbata*, Hutt.: Suter, P. Mal. S., iii, 8. *Rissoina (Eatoniella) limbata*, Hutt.: Webster, T.N.Z.I., xxxvii, 278, pl. 10, f. 8, 8*a* (operc. and dentition); Suter, T.N.Z.I., xxxviii. 327.

Shell very small, elongately conical, slightly rimate, smooth, and polished. *Colour* ashy-brown, usually with a posterior row of white spots and brown zigzag lines at the suture; last whorl often with angulated brown and white markings around the periphery. *Spire* elevated conic, higher than the aperture, outlines straight. *Protoconch* minute, globose, white, of 1½ smooth and convex whorls. *Whorls* 5–6, the last rather large in proportion, flatly convex; base rounded. *Suture* impressed. *Aperture* ovate, angled above. *Peristome* continuous, sharp, lightly callous inside, somewhat effuse at the base. *Columella* vertical, arcuate, a little callous and reflexed. *Umbilicus* indicated by a narrow chink. *Operculum* horny, with a claviform process (Webster, T.N.Z.I., xxxvii, pl. 10, f. 8*a*).

Diameter, 1·5 mm.; height, 2·7 mm.

Dentition.— Webster, T.N.Z.I., xxxvii, 278, pl. 10, f. 8. Very much like that of *R. olivacea*, Hutt.

Type in the Canterbury Museum, Christchurch.

Hab.—Auckland, type (T. F. Cheeseman); Cook Strait; Te Onepoto, near Lyttelton; Taumaki Island, South Island, in 10 fathoms (Captain Bollons); Dusky Sound, in 30 fathoms (R. Henry).

12. **Rissoina olivacea**, Hutton, 1882. Plate 13, fig. 19.

Dardania olivacea, Hutt., T.N.Z.I., xiv, 1881 (1882), 147, pl. 1, f. K, 1–4. *Rissoina olivacea*, Hutton, P.L.S. N.S.W., ix, 940; Suter, P. Mal. S., iii, 7; Webster, T.N.Z.I., xxxvii, 279, pl. 10, f. 9*a* (operc. and teeth of radula). *Jeffreysia (Dardania) olivacea*, Hutt., Man. Conch. (1), ix, 397, pl. 60, f. 95.

Shell very small, ovate, imperforate, rather solid, smooth. There is no *sculpture* except fine growth-lines. *Colour* olive-brown when alive, purplish-black when dry. *Spire* elevated conical, higher than

the aperture, outlines nearly straight. *Protoconch* minute, globular. *Whorls* 5, regularly increasing, flatly convex; base rounded. *Suture* not deep. *Aperture* roundly ovate, slightly angled above. *Peristome* continuous, faintly callous and whitish, sharp, very thin over the parietal wall. *Columella* subvertical, arcuate, thickened but not reflexed. *Operculum* ovate, subspiral, with a long shelly process from below the nucleus (Hutton, *l.c.*, pl. 1, f. K, 4).

Diameter, 1·5 mm.; height, 2 mm. (type): usually 2 mm. by 3 mm.

Animal light brown, foot and tentacles white. Rostrum emarginate at the extremity; tentacles long, slender, smooth; eyes large, on swellings at the outer bases of the tentacles. Foot large, rounded in front, and emarginate behind; opercular lobe small, simple; sole with a median longitudinal groove. (Hutton, *l.c.*, pl. 1, f. K, 2.)

Dentition.—The central tooth is as broad as long, and with 5 cusps. The first lateral tooth has 5 denticles, the middle one larger than the others; the second lateral with 3 denticles, the inner one the smallest; the third lateral is narrow, abruptly bent and expanded near the base, it has 3 minute denticles. (Hutton, *l.c.*, pl. 1, f. 3.)

Type in the Canterbury Museum, Christchurch.

Hab.—The type is from Lyttelton Harbour. Throughout New Zealand, on seaweeds, mostly in rock-pools.

Fossil in the Pliocene.

Var. **annulata**, Hutton, 1884.

Rissoina olivacea, var. *annulata*, Hutt., N.Z.J.S., ii, 173; P.L.S. N.S.W., ix, 940; Webster, T.N.Z.I., xxxvii, 279.

Distinguished from the species by the narrow white band below the suture. In all other characters it does not differ from the species.

Diameter, 1·5 mm.; height, 2 mm.

Dentition the same as in the species.

Type in the Canterbury Museum, Christchurch.

Hab.—Hauraki Gulf, together with the species; Banks Peninsula (Iredale).

Var. **lutea**, Suter, 1908.

Rissoina olivacea, Hutt., var. *lutea*, Suter, P. Mal. S., viii, 33.

Distinguished from the species by its light horn-colour, and in being a little more slender.

Diameter, 1·4–1·5 mm.; height, 2·5–2·7 mm.

Dentition unknown.

Type in my collection.

Hab.—Maloney's Reef, Hauraki Gulf, type (H. S.); Lyttelton Harbour, on seaweeds (H. S.); Titahi Bay, Cook Strait (Miss Mestayer).

Remark.—Mostly together with the species.

Genus 5. Skenella, Pfeffer, 1886.

Skenella, Pfeffer, "Die Mollusken von Süd-Georgien," in Jahrb. d. Hamb. Wissensch. Anstalten, 1886, 96. Type: *S. georgiana*, Pfeffer.

Shell depressed, umbilicated; peristome simple, connected over the parietal wall; operculum subspiral, with a large process vertical to the nucleus.

Shell resembling *Skenea* in form.

1. **Skenella Pfefferi**, Suter, 1909. Plate 13, fig. 20.

Skenella Pfefferi, Suter, P. Mal. S., viii, 1909, 253, pl. 11, f. 2.

Shell minute, globosely depressed, thin, pellucid, shining, smooth, umbilicated. There is no *sculpture*. The *colour* is amber on the first 2 whorls, light horn on the last whorl. *Epidermis* very thin, yellowish, slightly polished. *Spire* conoidal, very low, convex, its height about one-third that of the aperture. *Protoconch* flatly convex, rather large. *Whorls* $2\frac{3}{4}$ to 3, rapidly increasing, convex, the last not descending, ample, with a regularly rounded periphery; base flattish, angled around the umbilicus. *Suture* deep. *Aperture* large, subcircular. *Peristome* convex, sharp, thin. *Columella* vertical, lightly arcuate. *Inner lip* slightly callous and reflexed, spreading as a distinct callosity over the convex parietal wall. *Umbilicus* open, about one-sixth of the diameter. *Operculum* thin, almost colourless, subspiral, the nucleus near the margin, with an elongated subvertical process.

Diameter, 0·8 mm.; height, 0·45 mm.

Animal unknown.

Type in my collection.

Hab.—Te Onepoto, near Lyttelton, on seaweeds, type (H. S.); Lyall Bay (Miss Mestayer).

Remarks.—This species is nearly allied to *S. georgiana*, Pfeffer, from South Georgia, but it is much smaller, the spire more depressed, the parietal callus not so strong, and the aperture not semicircular.

Fam. **LITIOPIDÆ**, Fischer.

Animal having on each side 3 cirriform epipodial filaments, operculigerous lobe with 2 appendages posteriorly; there is no siphon. Central tooth of radula subquadrangular, devoid of basal denticles; lateral teeth as in the *Rissoidæ*.

Shell minute, thin, smooth, plicate or spirally striate. Columella truncated at its base; operculum horny, spiral.

Genus 1. Diala, A. Adams, 1861.

Diala, A. Adams, A.M.N.H., viii, 1861, 242. Type: *D. varia*, A. Adams = *semistriata*, Phil.

Shell spirally striate, not varicose, sometimes a little nodulous around the middle; columella nearly straight, not truncate; lip simple.

But few species are known.

Distribution.—Japan, Philippines, Australasia.

1. **Diala subcarinata**, Murdoch and Suter, 1906. Plate 13, fig. 21.

Diala subcarinata, Murdoch and Suter, T.N.Z.I., xxxviii, 1905 (1906), 292, pl. 24, f. 29.

Shell minute, subulate, smooth, narrowly perforate. *Sculpture:* The longitudinals consist of minute growth-striæ, with a few growth-periods, subcostate in places. *Colour* porcellanous-white. *Spire* high, slender, and tapering. *Protoconch* consists of about 2 smooth rounded whorls, the second slightly swollen, the nucleus oblique. *Whorls* 7, slightly rounded; the antepenultimate whorl is indistinctly feebly bicarinate; this is better defined upon the next whorl, especially the superior angle which forms the subtabular sutural shelf; upon the last 4 or 5 feeble carinæ, 3 of which are above the aperture; base rounded. *Suture* deep. *Aperture* vertical, subtriangular. *Outer lip* sharp, regularly curved, effuse, and angled at the junction with the basal extension of the columella, producing a small spout-like canal. *Inner lip* forming a narrow thin callosity on the pillar, which is subvertical and slightly sinuated; a thin callus extends above over the body to the outer lip. *Umbilicus* very narrow, open. *Operculum* unknown.

Diameter, 1·04 mm.; height, 2·9 mm.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms.

A single empty shell was obtained.

Fam. **OMALOGYRIDÆ**, Sars.

Animal having the body flattened, ciliated in front, no cephalic tentacles; eyes sessile. Radula having the formula 1+1+1, the central tooth with a quandrangular base with a large cusp, imbricated, one series on the other; a lateral transverse plate replaces the lateral and marginal teeth.

Shell planorbiform, spire involute, mouth clasping both sides of the periphery; operculum corneous, few-whorled, nucleus central.

The animals are very active, and feed on algæ.

Genus 1. Omalogyra, Jeffreys, 1860.

Omalogyra, Jeffreys, J. de Conch., 1860. Type: *O. nitidissima*, Forbes and Hanley. *Ammonicerina*, Costa, 1861. *Homalogyra*, Jeffreys, 1867.

Shell small, discoid, flat, paucispiral; whorls usually more or less angled; aperture orbicular; peristome continuous; operculum circular.

Distribution.—Europe, Greenland, South Africa, and New Zealand.

Remarks.—The external characters of the animal and its dentition are peculiar, and its systematic position is uncertain.

Key to Species.

a. Last whorl smooth, convex	*fusca.*
aa. Last whorl bicarinate	*bicarinata.*

1. **Omalogyra fusca,** Suter, 1908. Plate 13, fig. 22.

Omalogyra fusca, Suter, P. Mal. S., viii, 33, pl. 3, f. 36.

Shell minute, planorbiform, thin and fragile, slightly shining. *Sculpture* consisting of very fine microscopic spiral striæ, faintly reticulated by growth-lines. *Colour* fuscous, with a few white radiate streaks and irregularly scattered spots. *Spire* depressed. *Protoconch* of 1 whorl, distinctly marked off from the next volution, spirally striate. *Whorls* $2\frac{3}{4}$, rather rapidly increasing, convex; base concave. *Suture* deep. *Aperture* circular. *Peristome* sharp, straight, slightly discontinuous through the intervening parietal wall. *Operculum* unknown.

Diameter, 1 mm.; height, 0·3 mm.

Animal unknown.

Type in my collection.

Hab.—Lyttelton Harbour, on seaweeds (H. S.).

2. **Omalogyra bicarinata,** Suter, 1908. Plate 14, fig. 1.

Omalogyra bicarinata, Suter, P. Mal. S., viii, 33, pl. 3, f. 37, 37*a*.

Shell minute, discoidal, thin, not shining. *Sculpture* consists of 2 fine keels only, 1 above and 1 below the periphery. *Colour* white. *Spire* depressed. *Protoconch* of 1 smooth whorl, marked off from the next. *Whorls* $2\frac{1}{4}$, rather rapidly increasing, flattened above and below, convex at the periphery, bicarinate; base slightly concave. *Suture* canaliculate. *Aperture* subquadrate. *Peristome* continuous, thin, and straight. *Operculum* unknown.

Diameter, 1·5 mm.; height, 0·5 mm.

Animal unknown.

Type in my collection.

Hab.—Snares, in 50 fathoms (Captain Bollons).

Fam. **HYDROBIIDÆ**, Fischer.

Animal having a long rostrum; tentacles elongated, with the eyes at their outer bases. Ctenidium monopectinate; sexes separate; the intromittant organ distant from the right tentacle, and generally appendiculated; one otolith in each otocyst. Jaws are usually present. Formula of teeth of radula $2+1+1+1+2$; the central tooth mostly with basal denticulations.

Shell with a prominent spire, turbinate or turriculate; peristome continuous; operculum variable, horny or calcareous, concentric, spiral or subspiral.

The *Hydrobiidæ* are small oviparous molluscs, living in fresh or brackish water, some of them even, though branchiferous, out of the water.

Subfam. LITHOGLYPHINÆ.

Foot simple; central tooth of radula with basal denticulations; intromittant organ simple or bifurcate; operculum corneous, spira or subspiral.

Genus 1. Potamopyrgus, Stimpson, 1865.

Potamopyrgus, Stimpson, Amer. Journ. Conch., i. 1865, 53. Type: *Melania corolla*, Gould. *Pyrgophorus*, Ancey, Bull. Soc. Mal. France, v, 1888, 188, 192.

The animal has long, pointed tentacles; the eyes on the prominent tubercles. Stimpson's description of the dentition of the type is as follows: "Rhachidian tooth trapezoidal; inferior margin nearly straight, faintly trilobate; basal teeth minute and close to the lateral margins. Intermediate tooth with the peduncle very long, three times as long as the body, and constricted at its juncture therewith; body subrhomboidal and excavated in the middle; cusp with numerous equal teeth. Lateral teeth constricted near the summit, and with the dorsal or outer margin of the shank reflexed or thickened; outer lateral with a broad summit, shaped like a chopping-knife. Formula of the denticles: $\frac{9}{4+4}-11-15-20$." (Stimpson's intermediate tooth is really a lateral, and his laterals are the marginals.)

Shell ovate-conic, imperforate; apex acute; whorls coronated with spines; outer whorl nearly two-thirds the length of the shell; aperture ovate; outer lip acute; operculum corneous. (Stimpson.)

Many species are polymorphic, and one and the same species may have a spinous angulate, an angulate espinous, and an acuminate ecarinate form.

The genus is, according to Pilsbry, of great antiquity, extending at least as far back as the early Eocene. It now comprises all the fresh-water Rissoids of New Zealand, a majority of those of Australia and Tasmania, with species in West Africa and tropical America.

Living in fresh and slightly brackish water.

Key to Species.

A. The same species spinose, shouldered, or with smooth rounded whorls.
  a. Shell ventricose, last whorl swollen; spines, if present, long, directed upward. Ratio of diameter to height 1 : 1·44 to 1 : 1·7 .. .. *corolla.*
  aa. Shell smaller, much more slender, last whorl not ventricose; spines, if present, short. Ratio of diameter to height 1 : 1·25 .. .. *Badia.*

B. Shell never spinous or shouldered, smooth.
  a. Shell ovate.
    b. Height about 6 mm., whorls flattish, outlines of spire straight .. .. *antipodum.*
    bb. Height less than 6 mm.
      c. Shell much elongated, height 4 mm. to 5 mm., spire much higher than aperture .. .. *egenus.*
      cc. Shell shortly oval, height about 3 mm., spire $1\frac{1}{2}$ the height of aperture .. .. .. *spelæus.*
  aa. Shell subcylindrical, very thin and fragile .. .. *subterraneus.*

1. **Potamopyrgus antipodum,** Gray, 1843. Plate 14, fig. 2.

Amnicola antipodanum, Gray, Dieff. N.Z., 241. *Hydrobia antipodum*, Gray, Ereb. & Ter., 3, pl. 1, f. 19, above. *Bythinella antipoda*, Gray: Hutton, M.N.Z.M., 81. *Potamopyrgus antipodum*, Gray: Hutton, T.N.Z.I., xiv, 145, pl. 1, f. C, except upper right figure; Suter, T.N.Z.I., xxxvii, 263.

Shell small, ovate, acute, sometimes rimate, generally covered with a brown earthy coat, smooth. *Colour* dark brown. *Spire* elevated conic, higher than the aperture, outlines straight. *Protoconch* small, acute, very often eroded. *Whorls* 7, regularly increasing, flatly convex; base convex. *Suture* not much impressed. *Aperture* ovate, angled above. *Peristome* continuous, black, with a white inner callus, *Columella* arcuate, very little reflexed. *Operculum* brown, horny, paucispiral; nucleus subcentral.

Diameter, 3·2 mm.; height, 6·1 mm.

Dentition.—Hutton, T.N.Z.I., xiv, 145, pl. 1, f. G.

Type in the British Museum.

Hab.—Throughout New Zealand, very often in brackish water.

Remark.—The statement made by Von Martens that "some specimens are bristly" is not correct. This species has never been found with spines or a carina.

Subsp. **zelandiæ,** Gray, 1843. Plate 14, fig. 3.

Amnicola (?) *zelandiæ*, Gray, Dieff. N.Z., 241. *Hydrobia zelandiæ*, Gray, Ereb. & Ter., 3, pl. 1, f. 19, below. *Bythinella zelandiæ*, Gray: Hutton, M.N.Z.M., 81. *Potamopyrgus antipodum*, subsp. *zelandiæ*, Gray: Suter, T.N.Z.I., xxxvii, 263.

This subspecies is distinguished from the species by its somewhat smaller size, more tapering form, the generally more convex whorls, and slightly deeper suture.

Diameter, 2·5 mm.; length, 5 mm. (type).

Type in the British Museum.

Hab.—Nelson; Wellington; Wanganui; Forty-mile Bush; Riverhead, Waitemata Harbour.

Remark.—It is much rarer than *antipodum*, but shows also a good amount of variation.

2. **Potamopyrgus Badia,** Gould, 1848. Plate 13, fig. 23.

Amnicola Badia, Gould, P. Bost. S.N.H., iii, 1848, 75; U.S. Expl. Ex., xii, 126, f. 150. *Hydrobia Fischeri*, Dunker, Mal. Blätt., viii, 1862, 152. *H. Reevei*, Frauenfeld, V.Z.B.G. Wien, xiii, 1024. *Bythinella Fischeri*, *Badia*, *Reevei*, Hutton, M.N.Z.M., 82. *Potamopyrgus corolla*, Gould: Hutton, T.N.Z.I., xiv, 145, pl. 1, f. B, not of Gould. *P. Badia*, Gld.: Suter, T.N.Z.I., xxxvii, 264, 249.

Shell small, ovate-conical, acute, thin, very frequently with a black coating, imperforate. *Sculpture* consisting typically of a carina on the shoulder, but usually there is a row of short spines on the last 3 whorls; clean specimens show fine oblique growth-striæ. *Spire*

elevated conical, acute, outlines slightly convex. *Protoconch* minute, sharp. *Whorls* 6, regularly increasing, convex, rounded or shouldered, with or without spines; base convex. *Suture* not deep. *Aperture* ovate, subangled above. *Peristome* continuous, thin and sharp, with a very thin inner callosity. *Columella* arcuate, thin, very little expanded. *Operculum* normal.

Diameter, 2 mm.; height, 5 mm. (type). Ratio of D : H = 1 : 2·5. The usual dimensions are 2·5–3 mm. by 5 mm.

Dentition.—Hutton, T.N.Z.I., xiv, 145, pl. 1, f. F.

Type in the U.S. Nat. Museum, Washington.

Hab.—South Island of New Zealand, in lakes, rivers, and creeks. The type is from Banks Peninsula (Pickering).

Remarks.—The species attains a very large size, 4 mm. by 8 mm., in Lake Te Anau, and somewhat smaller in Lake Wakatipu, in depths from 20 ft. to 300 ft. Specimens of a very light brown colour have been found some years ago in meters connected with artesian wells at Sumner, near Christchurch.

3. Potamopyrgus corolla, Gould, 1847. Plate 13, fig. 24.

Melania corolla, Gld., P. Bost. S.N.H., ii, 1847, 223. *Melania corolla*, Gld., Conch. Icon., f. 366. *Amnicola corolla*, Gould, U.S. Expl. Ex., xii, 129, pl. 9, f. 149, *a–c*. *Paludestrina Cumingiana*, P. Fisch., J. de Conch., 1860, 208, pl. 4, f. 7. *Hydrobia Crossei*, Frfld., V.Z.B.G. Wien, 1865, 595. *Bythinella corolla*, Gld.: T.-Woods, P.L.S. N.S.W., iii, 135, pl. 13, f. 2, 3, 5. *Hydrobia corolla*, Hutt., M.N.Z.M., 83. *Potamopyrgus Cumingiana*, Fisch.: Hutton, T.N.Z.I., xiv, 144, pl. 1, f. A. F. *P. corolla*, Gld.: Suter, T.N.Z.I., xxxvii, 260, 246.

Shell small, ovate-conic, ventricose, thin, subpellucid, spinous, angulate espinous, or smooth and rounded. *Sculpture*, if present, consisting of numerous spines on a carina encircling the whorls a little above the periphery, 17–20 on the last whorl; they are long, rather distant, curved, directed upward; the first $3\frac{1}{2}$ whorls have no spines; sometimes there is only a black thread present, or the whorls may be rounded and smooth. *Colour* light-yellowish, often covered with a black coating. *Epidermis* thin, slightly shining in some specimens. *Spire* elevated conic, a little higher than the aperture, outlines straight. *Protoconch* small, acute, of about 2 convex smooth whorls. *Whorls* $6\frac{1}{2}$, shouldered or rounded, the last large and somewhat swollen; base convex. *Aperture* ovate, oblique, angled above. *Peristome* continuous, strengthened by a white inner callus. *Columella* arcuate, very little reflexed. *Operculum* horny, subspiral.

Diameter, 4·5 mm.; height, 6·5 mm. Ratio of D : H = 1 : 1·44.

Dentition.—Hutton, T.N.Z.I., xiv, 144, pl. 1, f. E.

Type in the U.S. Nat. Museum, Washington.

Hab.—North Island of New Zealand, in lakes, rivers, and creeks; Chatham Islands.

Subsp. Salleana, P. Fischer, 1860. Plate 14, fig. 4.

Paludestrina Salleana, Fisch., J. de Conch., viii, 1860, 208, 209, pl. 4, f. 6. *Potamopyrgus corolla*, Gld., subsp. *Salleana*, Fisch.: Suter, T.N.Z.I., xxxvii, 247, 262.

Shell horn-colour, conical, thin. The last 4 whorls are spinous; the spines are short, black, directed upwards; typically there is a chordate carina on the last whorl below the row of spines. *Whorls* 7–7½, flatly convex. *Aperture* ovate. *Peristome* continuous, but little callous.

Diameter, 3·5 mm.; height 6 mm. Ratio of D : H = 1 : 1·7.

This subspecies differs from *corolla* in being more slender, less ventricose, in having spines on the last 4 whorls (against 3 in the species), and a chordate carina below the row of spines, which, however, is quite an exceptional occurrence; very often specimens are subangled below the periphery.

Type.—Collection of the "Journal de Conchyliologie," Paris.

Hab.—Widely distributed throughout the North Island; Pelorus River, Nelson, and Collingwood, South Island.

Remarks.—All the specimens in my collection are yellowish-brown, thinner than *corolla*, mostly without spines, and some are larger than the type: diameter, 4·5 mm.; height, 8 mm. The Nelson specimens are from brackish water. The only specimens with a slight chordate carina below the series of spines are from Lake Manapouri.

4. Potamopyrgus egenus, Gould, 1848. Plate 14, fig. 5.

Amnicola egena, Gld., P. Bost. S.N.H., iii, 1848, 75. *A. gracilis*, Gould, U.S. Expl. Ex., xii, 127, f. 151, *a*, *b*. *Bythinella egena*, Gld.: Hutton, M.N.Z.M., 82; T.N.Z.I., xiv, pl. 1, f. C, upper right figure. *Potamopyrgus egenus*, Gld.: Suter, T.N.Z.I., xxxvii, 265.

Shell elongate, minute, turreted, delicate, smooth, with faint striæ of growth. *Epidermis* thin, pale green. *Spire* acute, much higher than the aperture. *Protoconch* minute, globose. *Whorls* 5 to 7, regularly increasing, convex, the last one half the length of the shell; base rounded. *Suture* impressed. *Aperture* ovate, one-third the length of the shell, angled above. *Peristome* continuous, acute, white and slightly callous inside; there is an indistinct umbilical chink or the inner lip is separated from the body by a narrow groove. *Operculum* typical. No carinated or spinous forms are known.

Diameter, 2·5 mm.; height, 5 mm. (type). Diameter, 2·25 mm.; height, 5 mm. (specimen with 7 whorls). Diameter, 1·75 mm.; height, 4 mm. (specimen with 6 whorls).

Animal unknown.

Type in the U.S. Nat. Museum, Washington.

Hab.—Banks Peninsula (type); Little River, Banks Peninsula (H. S.); Nelson; Kaiwarrawarra River (H. S.).

Remark.—The species is rare and local, but well marked by its graceful elongated form.

5. **Potamopyrgus spelæus,** Frauenfeld, 1862. Plate 14, fig. 6.

Hydrobia spelæa, Frfld., V.Z.B.G. Wien, xiii, 1862, 1022; xv, 526, pl. 8. *Bythinella spelæa*, Frfld.: Hutton, M.N.Z.M., 82. *Potamopyrgus spelæus*, Frfld.: Suter, T.N.Z.I., xxxvii, 266.

Shell very small, conical, rather solid, subtransparent, faintly shining, smooth, rimate. *Colour* of type yellowish-white, fresh specimens, however, are greenish or brownish yellow, mostly with a thin brown coating. *Spire* elevated conical, a little higher than the aperture, outlines convex. *Protoconch* minute, globular. *Whorls* 5, slightly convex, the last rather large; base rounded. *Suture* deep. *Aperture* oval, angled above, oblique. *Peristome* continuous, slightly expanded, mostly brown, free above, thence connected with the body, leaving a narrow chink below. *Operculum* normal.

Diameter, 1·6 mm.; height, 3 mm. (type).

Animal unknown.

Type in the K.K. Hofmuseum, Vienna.

Hab.—In caves with *Dinornis* bones, together with *P. Reevei*, in Cuming's collection (type); salt springs, Te Mahia, Hawke's Bay (A. Hamilton); Wanganui River, tidal part (R. Murdoch); upper Wanganui River (Chadwick); cold mineral pool, Rotorua (Lady F. Brown); Te Aroha, in hot-spring water (C. Cooper); Onehunga Springs.

ubsp. pupoides, Hutton, 1882. Plate 14, fig. 7.

Potamopyrgus pupoides, Hutt., T.N.Z.I., xiv, 1881 (1882), 146, pl. 1, f. D, H. *P. spelæus*, Frfld., subsp. *pupoides*, Hutt.: Suter, T.N.Z.I., xxxvii, 266.

It is distinguished from the species by its cylindrical form, the much flatter whorls, and the less impressed suture.

Diameter, 0·9 mm.; height, 1·5–1·75 mm.

Dentition.—Hutton, T.N.Z.I., xiv, 146, pl. 1, f. H.

Type in the Canterbury Museum, Christchurch.

Hab.—Heathcote Estuary, type (Hutton); Parua Bay, Whangarei; Onehunga Springs: in brackish water.

6. **Potamopyrgus subterraneus,** Suter, 1905. Plate 14, fig. 8.

Potamopyrgus subterraneus. Suter, T.N.Z.I., xxxvii, 1904 (1905), 267, fig. in text.

Shell minute, subcylindrical, fragile, opaque-white, smooth. *Spire* pupoid; apex blunt. *Whorls* 5, convex, the last whorl more than half the axis. *Suture* well impressed. *Aperture* very oblique, oval. *Peristome* very thin, membranaceous (specimen apparently not quite adult), continuous. *Columella* subvertical, slightly callous, very little reflexed. *Umbilicus* indicated by a narrow chink. *Operculum* unknown.

Diameter, 1·25 mm. ; height, 2·75 mm.

Animal unknown.

Type in my collection.

Hab.—The only specimen was obtained by Mr. W. W. Smith, of Ashburton, in 1892, by pumping water from a well 48 ft. deep.

Remarks.—The shell is exceedingly fragile, and distinguished, like *P. pupoides*, by its subcylindrical form. The nearest allies are *egenus* and *spelæus*, but it differs considerably from both. It most likely has been derived from the latter species, and its subterranean habitat is no doubt a long-established one.

Fam. **THIARIDÆ.**

Melaniidæ, Gray.

Animal having the rostrum large, well developed, sinuate in front. Tentacles subulate, with the eyes on bulgings at their outer sides. Foot large and short, subtruncate, with a rudimentary siphonal fold in front, obtuse posteriorly. Mantle-margin generally fringed. Intromittant organ behind the right tentacle ; reproduction viviparous. A single gill, composed of rigid, cylindrical plates. Central tooth of radula trapezoidal, margin multicuspidate ; lateral tooth narrow, with a broad anterior plate, and a number of cusps, the median one being larger ; marginals long and narrow, multicuspid.

Shell spiral, generally turreted, covered with a thick dark-coloured epidermis ; aperture often channelled or emarginate below ; outer lip simple, sharp ; operculum horny, ovate, spiral or sublamellate ; nucleus subcentral or marginal.

These animals are fluviatile, being inhabitants of fresh-water lakes and rivers throughout the warmer parts of the world.

Genus 1. Melanopsis, Férussac père, 1807.

Melanopsis, Férussac, "Essai d'une méthode conchyliologique," 1807, 70. Type : *M. costata*, Fér. *Faunus*, Megerle, not of Montfort. *Campeloma*, Rafin. *Ceneona*, Gist. *Bulliopsis*, Conrad.

Animal having the tentacles long and pointed. Mantle-margin not fringed.

Shell ovate, last whorl elongated, smooth or longitudinally plicate ; spire short, acute ; aperture oblong, distinctly notched in front ; inner lip thick, with a posterior callus ; outer lip simple, acute ; operculum paucispiral or subspiral ; nucleus submarginal, terminal.

Distribution. — New Zealand, New Caledonia, Spain, northern Africa, Asia Minor.

This genus dates back to the Cretaceous ; it is widely distributed in the Tertiary of Europe, and several species are known from the Miocene of the United States (Maryland).

1. **Melanopsis trifasciata,** Gray, 1843. Plate 39, fig. 11.

Melanopsis trifasciata, Gray, Dieff. N.Z., 263. *M. zelandica*, Gould, P. Bost. S.N.H., ii, 1843, 225; U.S. Expl. Ex., xii, 130, f. 146, *a, b*. *M. Strangei*, Reeve, Conch. Icon., f. 3. *M. ovata*, Dunker, Malak. Blätt., viii, 150. *M. trifasciata*, Gray; Smith, Ereb. & Ter., ii, pl. 1, f. 18–22; Hedley and Suter, P.L.S. N.S.W. (2), vii, 618; Suter, J. de Conch., xli, 220.

Shell ovate, rather thin, smooth, the spire very often much eroded. *Sculpture* consisting of irregular growth-striæ, very often developed into folds, giving the shell an irregularly costellate appearance; some specimens are slightly wrinkled and malleated. *Colour* dark olive, the last whorl with 1 or 3, rarely 2, chestnut spiral bands, the first above, the second below the periphery, and the third at the base, the latter 2 a little closer together. *Epidermis* solid, dull or only faintly shining. *Spire* short, conical, acute, about one-third the length of the shell; outlines straight. *Protoconch* conical, of 1 very rapidly increasing costellate whorl. *Whorls* 3 to 4, very rapidly increasing, flat, the last very large, slightly ventricose; base convex, depressed upon the neck. *Suture* superficial. *Aperture* large, elongately oval, sharply angled above, distinctly notched below. *Interior* light blue, with chestnut spiral bands. *Outer lip* simple, acute, sometimes sinuate toward the base, and roundly produced beyond the end of the columella. The *columella* is strongly callous above, the callus white near the margin, yellowish-brown inside, then excavated, concavely twisted at the base, and sometimes with a few short folds on the outer margin.

Operculum obliquely striate, thin, horny; nucleus terminal.

Diameter, 11 mm.; height, 18 mm. (medium-sized specimen). Diameter, 17 mm.; height, 30 mm. (large specimen).

Dentition.—Hutton, T.N.Z.I., xv, 123, pl. 14, f. F.

Type in the British Museum.

Hab.—Waitangi Falls (Dieffenbach); Henderson, near Auckland (H. S.); Whangarei; River Thames; Petane Creek, near Napier; Wanganui River; Collingwood; Kenepuru Sound; Greymouth; Dunedin.

Fam. **CERITHIIDÆ,** Fleming.

Animal with the rostrum broad, short, and contractile; tentacles wide apart, subulate; eyes on short peduncles united to the outer side of the tentacles. Mantle-margin with a rudimentary siphonal fold in front; gill composed of a single series of plates. Foot broad and short, angulated in front. Radula long and linear; formula of teeth 2+1+1+1+2. Jaws cancellated.

Shell usually turriculated, sometimes very large, many-whorled, frequently varicose, the surface usually tuberculated, spinose, or costulate; aperture siphonostome, sometimes much expanded, always with a channel in front, which is more or less long and recurved; outer lip generally expanded in the adult; columella excavated, twisted

in front, very often with parietal plications; operculum corneous, spiral, with central or sublateral nucleus.

The shell is very variable in form, and especially in the anterior canal of the aperture, which is always rather short, but sometimes disappears completely.

The *Cerithiidæ* occur principally about tropical and semitropical shores, on rocks or among marine plants, littoral or in shallow waters. Many of them are estuary molluscs, and some inhabit fresh waters.

Subfam. 1. POTAMIDINÆ.

Shells usually covered with a brown epidermis; the fore part of the aperture more or less channelled, truncate, not produced into a beak; operculum orbicular, polygyrate; nucleus central.

Inhabiting the mouth of rivers, or salt marshes.

Genus 1. CERITHIDEA, Swainson, 1840.

Cerithidea, Swainson, Man. Malac., 1840. 203. 342. Type: *Murex decollatus*, L. *Aphanistylus*, Fischer, Man. de Conch., 682, 1884.

Animal with the eye-peduncles very long and thick, connate with the tentacles nearly to their tips.

Shell of moderate size, turriculated, conic; spire varicose, very often with truncated apex. Whorls narrow, convex, with a rather deep suture, ornamented with axial costæ, which are but little arcuate and sometimes crossed by spiral cords. Height of aperture one-third or one-fourth of the total length if the shell is not decollated. Last whorl generally carinated or angled at the periphery of the base, which is plane or oblique; the axial ribs are not continued upon the base. Neck very short or subobsolete, slightly excavated. Aperture subcircular. Peristome reflexed, with a slight parietal channel. Siphonal canal reduced to a lateral beak. Outer lip broadly rounded, thickened. Columella smooth, neither twisted nor plicate, obliquely truncate.

These molluscs are amphibious, crawling on the stones and leaves in the neighbourhood of brackish water in mangrove swamps, and at the mouths of rivers; during the dry season they close the aperture with the operculum, and hang, suspended by glutinous threads, to small branches and mangrove-roots.

Fossil in the Tertiary.

KEY TO SPECIES.

A Spire-whorls without spiral sculpture, except an occasional narrow groove below the suture .. .. .. *subcarinata.*

B Spire-whorls with spiral sculpture.

a. Deep spiral grooves, a narrow ridge in each .. .. *alternata.*

aa. Base with 2 spiral ridges, both near the periphery; whorls spirally lirate .. .. *bicarinata.*

aaa. Base with 3 spiral ridges, spire-whorls with 2–4 narrow spiral grooves .. .. *tricarinata.*

1. **Cerithidea alternata,** Hutton, 1873. Plate 39, fig. 12.

Cerithium alternatum, Hutt., C.M.M., 26. *Cerithidea alternata*, Hutt., M.N.Z.M., 74.

Shell moderately large, turriculated, rather solid, costate, and spirally grooved. *Sculpture* consisting of distant broad and rounded axial ribs, 8 to 9 on the last whorl, cut up into broad and narrow nodules by the spiral grooves, which are deep and having a small ridge in the bottom of each; there are about 10 of these grooves on the last whorl, 2 on the periphery of the base having 2 small ridges. *Colour* yellowish-brown. *Spire* elevated conical, twice the height of the aperture; outlines straight. *Protoconch* eroded. *Whorls* about 11, regularly and rather slowly increasing, slightly rounded; base flat, oblique. *Suture* impressed, margined above, wavy below. *Aperture* oblique, ovate, channelled above, produced at the base into a very short oblique and truncated canal. *Interior* white. *Outer lip* convex, thickened but sharp, denticulated outside by the spiral sculpture, grooved inside, each groove corresponding with an outer spiral riblet. *Columella* vertical, excavated, truncated below. *Inner lip* sharply limited outside the columella, united with the outer lip over the parietal wall. *Operculum* unknown.

Diameter, 10 mm.; height, 24·5 mm. (type). Angle of spire, 23°.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Tauranga (type).

2. **Cerithidea bicarinata,** Gray, 1843. Plate 39, fig. 13.

Cerithium bicarinata, Gray, Dieff. N.Z., 241. *Cerithidea (Pirenella) bicarinata*, A. Adams, P.Z.S., 1854, 83. *Cerithium bicarinatum*, Gray: Sowerby, Thes. Conch., ii, 288. *Cerithidea bicarinata*, Gray, Conch. Icon., xv, f. 27; Ereb. & Ter., pl. 1, f. 20; Man. Conch. (1), ix, 163, pl. 35, f. 15. *Cerithium lutulentum*, Kiener, Coq. Viv., 63, pl. 22, f. 3.

Shell turreted, moderately solid, costellate. *Sculpture* consisting of rather distant axial plications, 12–15 on the penultimate whorl, slightly arcuate, prominent or subobsolete, crossed by numerous spiral cords, mostly visible only on the lower whorls; base with a double ridge on its periphery, the lower one much stronger and separated by a groove from the upper ridge; the latter margins the suture of the last whorl; the lower ridge enters the aperture, forming with the outer lip a parietal channel; base with distinct growth-lines. *Colour* blackish-purple or brown, often with a brown or whitish coating. *Spire* very high, conic, about three times the height of the aperture; outlines straight. *Protoconch* eroded. *Whorls* about 12, regularly increasing, convex; base concave. *Suture* impressed. *Aperture* ovate, produced into a very short, open, oblique, and truncated canal. *Interior* blackish-brown. *Outer lip* convex, straightened above, very little thickened and expanded, sharp, with an interior orange margin. *Columella* light brown, slightly concave, smooth, base obliquely truncate. *Operculum* normal.

Diameter, 10 mm. ; height, 29 mm. Angle of spire, 23°.

Dentition.—Hutton, T.N.Z.I., xv, 122, pl. 14, f. D.

Type in the British Museum.

Hab.—Bay of Islands, type (Dieffenbach). Common in the North Island ; not found south of Banks Peninsula.

Fossil in the Pliocene.

3. Cerithidea subcarinata, Sowerby, 1855. Plate 14, fig. 9.

Cerithidea subcarinata, Sowerby, Thes. Conch., ii, 1855, 889, f. 287. *Cerithium australis*, Gray, Dieff. N.Z., 241, not of Lamarck. *Cerithidea nigra*, H. & J. ; Hutton, M.N.Z.M., 74, not of Hombron and Jacquinot. *Potamides* (*Cerithidea*) *bicarinata*, var. *subcarinata*, Sow., Man. Conch. (1), ix, 163, pl. 35, f. 16.

Shell small, elongated, longitudinally plicate, base bicarinate. *Sculpture* consisting of broadly rounded, slightly oblique axial ribs, about 12 on the penultimate whorl ; sometimes a narrow spiral groove below the suture is present ; the ribs are stopped at the periphery of the base by a spiral groove taking its origin at the suture ; base with 2 spiral ribs, the outer one strong and broad, the inner one, around the base of the neck, short and narrow ; they are often cut up into irregular nodules by incremental lines. *Colour* brownish-black, often with a light-brown coating. *Spire* elevated conical, about $2\frac{1}{2}$ times the height of the aperture, outlines slightly convex. *Protoconch* eroded. *Whorls* about 10, regularly increasing, flatly convex ; base slightly concave. *Suture* impressed. *Aperture* oblique, ovate, channelled above, produced at the base in a very short, oblique, and truncated canal. *Interior* dark brown, sometimes with 1 or 2 lighter bands. *Outer lip* convex, slightly thickened and expanded, not very sharp. *Columella* slightly concave, base truncated. *Inner lip* sharply marked off, and extending over the body to the outer lip, but prevented from reaching it by the narrow channel. *Operculum* normal.

Diameter, 4·25–5·5 mm. ; height, 11·5–14 mm. Angle of spire, 30°.

Dentition.—Hutton, T.N.Z.I., xv, 123, pl. 14, f. E.

Type in the British Museum.

Hab.—Throughout New Zealand, and at the Chatham Islands.

4. Cerithidea tricarinata, Hutton, 1883. Plate 14, fig. 10.

Cerithidea tricarinata, Hutton ; N.Z.J.S., i, 1883, 477 ; T.N.Z.I., xvi, 214.

Shell small, turreted, longitudinally plicate and spirally grooved. *Sculpture* consisting of strong, rounded, subnodulose, longitudinal ribs, 10 to 15 on the penultimate whorl, stopped on the body-whorl by a spiral sulcus on the periphery of the base ; spire-whorls and posterior half of the body-whorl with 3 or 4 spiral grooves, sometimes reduced to 2 ; base with 3 subequidistant well-marked spiral ridges, with occasionally others on the neck. *Colour* brown. *Spire* elevated, about three times the height of the aperture ; outlines faintly convex.

Protoconch eroded. *Whorls* 9 to 10, flattened, regularly increasing; base nearly flat, excavated round the neck. *Suture* impressed, sometimes margined. *Aperture* oblique, broadly ovate, channelled above, produced at the base into a short, oblique, and truncated canal. *Interior* brown, with a few lighter spiral bands. *Outer lip* convex, slightly thickened and expanded, sharp. *Columella* vertical, nearly straight, truncated at the base. *Inner lip* spreading over a short distance of the columella, sharply limited on the outside, extending over the parietal wall to the spiral ridge, which enters the aperture *Operculum* normal.

Diameter, 5 mm.; height, 14·5 mm.

Animal unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—Katikati (type); Ngunguru Harbour; Whangarei; Tiri Tiri Island; Hauraki Gulf and Auckland Harbour; Kawhia; Governor's Bay, Lyttelton; Chatham Islands (Dr. Dendy).

Subfam. 2. BITTIINÆ.

Basal lip extended beyond the truncature of the columella; canal with its slightly expanded margins almost reduced to a sublateral notch.

Genus 2. BITTIUM, Gray, 1847.

Bittium, Gray, P.Z.S., 1847, 154. Type: *Strombus reticulatus*, Da Costa.

Animal with a lanceolate foot, subtruncate in front; eyes placed at the external base of the rather long tentacles; operculigerous lobe with rudimentary expansions on the sides, siphon rudimentary. Central tooth of radula multicuspidate; lateral tooth securiform, with the margin denticulate; marginal teeth long and narrow, extremity pectinate.

Shell small, elongated, with numerous granular whorls and irregular varices; anterior canal short, not recurved; outer lip not reflected, usually with an exterior rib; basal lip extended beyond the canal; inner lip simple; operculum 4-whorled, with central nucleus.

Numerous species, inhabiting temperate waters.

Fossil in the Cretaceous and Tertiary.

KEY TO SPECIES.

A. Aperture with a distinct but short canal.
  a. Body-whorl with 9 to 10 spirals, suture margined; height about 17 mm. .. .. *granarium*
  aa. Body-whorl with 5 spirals, suture not margined; height, about 4 mm. .. .. *vitreum.*

B. Aperture without a distinct canal.
  a. Penultimate whorl with 8 spiral grooves; axial plications subobsolete or absent .. .. *Lawleyanum*
  aa. Penultimate whorl with 4 nodular spiral ridges .. *exile.*
  aaa. Penultimate whorl with 3 spiral threads, axial riblets distinct .. .. *cylindricum*
  aaaa. Penultimate whorl with 4 cinguli, crossed by about 20 axial riblets .. .. *retiferum.*

1. Bittium cylindricum, Watson, 1881. Plate 14, fig. 11.

Bittium cylindricum, Watson, J.L.S., xv, 118; Chall. Rep., xv, pt. 42, 478, pl. 30, f. 5; Man. Conch. (1), ix, 156, pl. 30, f. 18.

Shell small, high, narrow, pointed, cylindrically conical, reticulate, tubercled, strong, dark brown. *Sculpture:* Longitudinals—there are on the last whorl about 25 narrow, posteriorly convex, curved riblets, which cannot be followed from whorl to whorl down the spire, and which hardly appear on the base amidst the strong curved lines of growth found there; these riblets are parted by squarish furrows about as broad as themselves. Spirals—there are on each whorl 3 pretty equal, squarish, not prominent, spiral threads, which become prominent themselves and give prominence to the longitudinals by expanding into round-topped tubercles as they cross the riblets; they are separated by furrows, which are of about the same breadth as themselves; the sutural furrow is slightly deeper and broader than the others. The edge of the base is squarish, and is defined by a narrow, sharpish-edged spiral thread. The base, which is flatly conical, is plain but for the lines of growth; the pillar is defined by a minute, sharpish spiral thread, which runs round its top and meets the slit of the canal. Besides these the whole surface of the shell is microscopically scored with irregular lines of growth and fine spiral scratches. *Colour* dark ruddy-brown, uniform all over. *Spire* high, narrow, pointed, with straight but slightly angulated contour-lines; the first 8 whorls expand regularly, so as to form a minute cone, while the last 4 expand more slowly, so at to give more of a cylindrical shape. *Apex* small, blunt, rounded, slightly oblique, and a little immersed. *Whorls* 13, flat, except the last, which is slightly convex, with a somewhat flat but conical base. *Suture* in the bottom of a deep furrow is concealed by a projection of the inferior whorl. *Mouth* oval, with a small rounded sinus at the upper outer corner, and a largish and deepish canal running in behind the pillar. *Outer lip* not expanded, deeply corrugated by the ends of the spirals, a deep V-shaped fissure forming the canal. *Pillar* straight, not short, pretty strong, with a rounded, narrow, twisted edge, and a small but not sharp point, which is very slightly everted. *Inner lip* little more than a film on the body and pillar. (Watson.)

Diameter, 1·6 mm.; height, 6·75 mm.

Type in the British Museum.

Hab.—Foveaux Strait (A. Hamilton). The type is from Port Jackson, 2–10 fathoms.

2. Bittium exile, Hutton, 1873. Plate 14, fig. 12.

Cerithium exilis, Hutt., C.M.M., 27. *Bittium exilis*, Hutt., T.N.Z.I., xvi, 214.

Shell very small, elongated oval, spirally lirate. *Sculpture:* 2 to 4 spiral nodular ridges, about 6 on the base; between the ridges there is usually a fine spiral thread; the axial sculpture is only indicated by the presence of nodules on the spiral liræ. *Colour* dark

reddish-brown. *Spire* elongated conic, little more than twice the height of the aperture; outlines slightly convex. *Protoconch* minute, of 1 smooth and convex whorl. *Whorls* 8, first very slowly increasing, flatly convex; base flattish, oblique. *Suture* impressed. *Aperture* oval, minutely channelled above, narrowly effuse below, but no distinct canal, with a shallow notch. *Outer lip* sharp, thin. *Columella* subvertical. *Inner lip* very narrow, forming only a very thin glaze on the body-whorl. *Operculum* normal.

Diameter, 1·75 mm.; height, 5 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Stewart Island, in 30 fathoms (type); Hauraki Gulf.

3. **Bittium granarium**, Kiener, 1842. Plate 39, fig. 14.

Cerithium granarium, Kien., Icon. Coq. Viv., v, 1842, 72, pl. 19, f. 3. *Bittium granarium*, Kien., Man. Conch. (1), ix, 155, pl. 30, f. 98; Pritchard and Gatliff, P.R.S. Vic., xiii (n.s.), 153. *Cerithium lacertinum*, Gould, P. Bost. S.N.H., vii, 1861, 386; Conch. Icon., 1865, f. 129. *B. granarium*, Kien.: Suter, P. Mal. S., viii, 34.

Shell small, elongate, with granular whorls. *Sculpture* with axial riblets, about 20 on the penultimate whorl, crossed and cut up into numerous beads by spiral sculpture, 4 rows of beads on a whorl; the interspaces have sometimes a fine spiral thread, and one of them is margining the suture above; base with 5–6 subequidistant spiral riblets, close together on the neck; varices mostly indistinct. *Colour* reddish-brown or dark, dead shells white; sometimes the beads are chestnut-coloured on a light ground. *Spire* high, subulate, about three times the height of the aperture; outlines slightly convex, *Protoconch* minute. *Whorls* 12 to 13, first very slowly increasing, flat; base slightly concave around the neck. *Suture* impressed, margined. *Aperture* oblique, channelled above, produced into a very short broad and open canal, which is oblique, sublateral, and notched at the base. *Outer lip* thin and sharp. *Columella* short, arcuate. *Inner lip* rather narrow, limited by a narrow rim on the outside, spreading as a thin callosity over the parietal wall to the outer lip. *Operculum* normal.

Diameter, 5 mm.; height, 17 mm.

Animal unknown.

Type (?).

Hab.—Hauraki Gulf (E. A. Annett). Australia and Tasmania.

4. **Bittium Lawleyanum**, Crosse, 1863. Plate 14, fig. 13.

Bittium Lawleyanum, Crosse, J. de Conch., 1863, 87, pl. i, f. 4; Man. Conch. (1), ix, 154, pl. 30, f. 5; Tate and May, P.L.S. N.S.W., xxvi, 387; Pritchard and Gatliff, P.R.S. Vic. (n.s.), xiii, 154.

Shell small, subulate, spirally grooved, thin. *Sculpture* consisting of subequidistant spiral grooves, about 8 on the penultimate whorl, sometimes with distant broad axial plications and numerous

fine growth-lines ; base with 1 or 2 grooves near the periphery, centre smooth ; some specimens show low varices. *Colour* bluish, white-banded. *Spire* high, a little over three times the height of the aperture ; outlines straight. *Protoconch* minute, mostly eroded. *Whorls* about 11, flatly convex, slowly increasing ; base flatly convex. *Suture* deep. *Aperture* oblique, ovate, slightly channelled above, slightly notched and effuse below, but no distinct canal. *Outer lip* sharp, but slightly convex. *Basal lip* extending a little below the columella truncation. *Columella* straight. *Inner lip* very narrow, spreading over the body to the outer lip. *Operculum* normal.

Height, 10 mm.

Animal unknown.

Type.—Collection of the " Journal de Conchyliologie," Paris.

Hab.—New Zealand. Australia and Tasmania.

5. **Bittium retiferum**, Suter, 1908. Plate 14, fig. 14.

Bittium retiferum, Suter, P. Mal. S., viii, 34, pl. 3, f. 38.

Shell very small, subulate, thin and fragile. *Sculpture* consisting of 3 cinguli on the upper whorls, 4 on the body-whorl, the uppermost close to the suture and slightly lower ; crossed by straight equidistant axial riblets, about 20 on the last whorl, interstices with microscopic fine growth-lines ; points of intersection ornamented with round gemmules. *Colour* yellowish-white. *Spire* high, conical, much higher than the aperture ; outlines almost straight. *Protoconch* papillate, of 2 convex smooth whorls, a little deviated from the vertical axis. *Whorls* about 7, regularly increasing, flatly convex ; base smooth and slightly concave. *Suture* impressed, channelled by the cinguli. *Aperture* ovate, vertical, angled above, produced below into a short, widely open, and basally emarginate canal. *Outer lip* sinuated by the spiral sculpture. *Basal lip* produced beyond the canal. *Columella* short, rounded, gently curved off toward the short margin of the canal ; parietal wall concave. *Operculum* unknown.

Diameter, 1 mm. ; height, 3·2 mm.

Animal unknown.

Type in my collection.

Hab.—Snares, in 50 fathoms (Captain Bollons).

6. **Bittium vitreum**, Suter, 1908. Plate 14, fig. 15.

Bittium vitreum, Suter, P. Mal. S., viii, 34, pl. 3, f. 39.

Shell small, elongate, thin and fragile, translucent, finely reticulated. *Sculpture :* The first 2 whorls smooth, the following 4 with 3 sub-equidistant fine spiral threads, and the body-whorl with 5, the two lowest a little stronger than the others ; they are reticulated by sub-equidistant, slightly oblique, and flexuous axial threads, slightly nearer together than the spiral lines ; interstices with fine microscopical growth-striæ ; the axial sculpture extending over the base. *Colour*

yellowish-white. *Spire* high, turriculated; outlines lightly convex. *Protoconch* of 2 convex, smooth, and polished whorls. *Whorls* 7, regularly increasing, convex, flattened towards the suture; base slightly convex. *Suture* impressed. *Aperture* subquadrangular, produced below into a short and open canal. *Outer lip* rounded, thin, and sharp. *Basal lip* bent almost straight over towards the canal. *Columella* vertical, straight, curving off at the base to form the inner margin of the canal. *Operculum* unknown.

Diameter, 1·8 mm.; height, 4·2 mm. (shell of 7 whorls).

Animal unknown.

Type in my collection.

Hab.—Foveaux Strait, in about 15 fathoms.

Fam. **CERITHIOPSIDÆ**, H. and A. Adams.

Animal with a short, broad head; tentacles subulate, obtuse, wide at the base; eyes placed centrally at their origin; mouth with a retractile proboscis; tongue armed with teeth resembling in arrangement those of *Trichotropis*. Mantle not reflected, furnished with a rudimentary siphonal fold. Foot oblong, subquadrate in front, where it is furnished superiorly with a mentum, grooved for half its length below, the groove terminating in a perforation; operculigerous lobe well developed.

The head is compressed and vertically cloven in front, and the tips of the tentacles are obtuse or very slightly clavate; the eyes are placed rather close together towards the centre of the base of the tentacles. (H. and A. Adams.)

Shell small, cerithiform, canal notched at its base; there is no parietal channel. Aperture subquadrangular; outer lip not produced in front. Columella smooth, more or less twisted below near the origin of the canal. Operculum suboval, paucispiral; nucleus sublateral, near the inner side of the aperture.

Fossil this family first appears in the Cretaceous.

Key to Genera.

A. Form cylindro-conic, whorls tuberculate, columella inflexed towards the basal notch	Cerithiopsis.
B. Form conic, whorls cancellate, canal strongly curved backwards, columella twisted and carinated	Newtoniella
C. Form cylindrical, whorls with simple spiral ribs	Seila.

Genus 1. Cerithiopsis, Forbes and Hanley, 1853.

Cerithiopsis, Forbes and Hanley. "British Mollusca," iii, 1853, 364. Type: *Murex tubercularis*, Montg.

Animal with a narrow foot, subtruncated in front and attenuated behind, with a longitudinal sulcus on the sole; tentacles cylindrical, the eyes sessile at their base; opercular lobe simple, well developed. Radula with an oval central tooth, its margin dentate, a large bicuspid lateral tooth, and unicuspid marginals with smooth margins.

Shell small, thin, cylindro-conic, narrow; protoconch polygyrate, with a slightly deviated nucleus; whorls numerous, tuberculate, not varicose, the last narrower in proportion; aperture small, subquadrangular, with a short, truncate, nearly straight canal; outer lip thin, not produced at the base; columella smooth, straight, not twisted below, but simply inflexed towards the basal notch.

Distribution.—Mostly occurring in northern and temperate seas.

Fossil.—Cretaceous.

KEY TO SPECIES.

A. Shell with 2 cinguli on the spire-whorls.
  a. Axial riblets about 12, points of intersection with nodules, which are also present on the protoconch .. *crenistria.*
  aa. Axial riblets about 20, points of intersection with gemmules, protoconch smooth .. .. .. *marginata.*
B. Shell with 3 cinguli on the spire-whorls.
  a. Canal notched at base.
    b. All cinguli with gemmules.
      c. Protoconch of 1½ whorls .. .. .. *cessicus.*
      cc. Protoconch of 3½ whorls .. .. .. *sarissa.*
    bb Upper cinguli without gemmules, protoconch of 1½ smooth whorls .. .. *styliformis.*
  aa. Canal not notched at base.
    b. Suture canaliculate .. .. *canaliculata.*
    bb. Suture not canaliculate, but deep.
      c. Suture margined, shell acicular .. .. *acies.*
      cc. Suture not margined, shell subulate .. *subantarctica.*

1. Cerithiopsis acies, Suter, 1908. Plate 14, fig. 16.

Cerithiopsis acies, Suter, P. Mal. S., viii, 35, pl. 3, f. 40.

Shell very small, acicular, rather solid. *Sculpture* consisting of 3 equidistant cinguli, the uppermost very thin and close to the suture, which is margined above by a fine thread; the last whorl with a fourth spiral ridge emerging from the suture; the spiral sculpture crossed by slightly oblique axial riblets, also equidistant and of the same width as the interstices, about 15 on the last whorl; the points of intersection raised into round gemmules; the axial sculpture is less prominent than the spiral. *Colour* white. *Spire* high and narrowly conical, much higher than the aperture; outlines almost straight. *Protoconch* polygyrate, cylindro-conical, of 4 slowly increasing, strongly convex, and smooth whorls. *Whorls* about 10, convex; base slightly concave. *Suture* deeply impressed. *Aperture* subquadrangular, vertical, with a short and widely open canal. *Outer lip* sinuated by spiral sculpture. *Columella* vertical, slightly sinuate, pointed at the base. *Operculum* unknown.

Diameter, 1·1 mm.; height. 3·5 mm.

Animal unknown.

Type in my collection.

Hab.—Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons).

2. Cerithiopsis canaliculata, Suter, 1908. Plate 14, fig. 17.

Cerithiopsis canaliculata, Suter, P. Mal. S., viii, 35, pl. 3, f. 42.

Shell small, subulate, solid, with channelled suture. *Sculpture* consisting of 3 spiral keels, equidistant, the uppermost weaker and close to the suture, the last whorl with an additional keel arising from the suture; crossed by oblique straight axial riblets, about 20 on the body-whorl, their interstices narrower than those between the cinguli; crossing-points raised into roundish gemmules. *Colour* light brown, the uppermost cincture of a darker colour. *Spire* high, conic, much higher than the aperture; outlines straight. *Protoconch* of all specimens broken off, 1 smooth and convex whorl only left. *Whorls* about 7, regularly increasing, flatly convex; base smooth and moderately concave. *Suture* deep, canaliculated by the cinguli. *Aperture* vertical, subquadrangular, produced below into a very short and open canal. *Outer lip* denticulated on the outside by the spiral sculpture. *Columella* subvertical, rounded, slightly sinuate, terminating in a blunt point below. *Operculum* unknown.

Diameter, 1·4–1·6 mm.; height, 4·4–5 mm.

Animal unknown.

Type in my collection.

Hab.—Bounty Islands, in 50 fathoms (Captain Bollons).

3. Cerithiopsis cessicus, Hedley, 1906. Plate 14, fig. 18.

Cerithiopsis cessicus, Hedley, P.L.S. N.S.W., 1906, 529. *Bittium minimum*, T.-Woods, P.R.S. Tas., 1878, 123; 1879, 37: Hedley, P.L.S. N.S.W., 1901, 722, f. 20. *Cerithiopsis minima*, T.-Woods: Tate and May, P.L.S. N.S.W., 1901, 385; not of Brusina, 1864. *C. cessicus*, Hedley: Suter, P. Mal. S., viii, 35.

Shell small, narrowly conic, solid. *Sculpture* consisting of 3 equidistant cinguli, the uppermost close to the suture, crossed by nearly straight axial riblets, the interstices about as broad as the riblets; the points of intersection raised into roundish gemmules; there are about 18 to 20 riblets on the last whorl; suture margined above by a very fine thread, which continues upon the body-whorl as a fourth keel. *Colour* yellowish-white. *Spire* elevated conic, much higher than the aperture; outlines slightly convex. *Protoconch* papillate, of 1½ whorls, the first smooth and shining, the remainder distantly plaited. *Whorls* about 8, regularly increasing, somewhat convex; base concave and smooth. *Suture* impressed, margined, sometimes very indistinctly. *Aperture* vertical, ovate, angled above, produced below into a very short and wide canal with a notched base. *Outer lip* sharp, sinuated by the spiral sculpture. *Columella* slightly oblique, rounded and sinuate, truncated below. *Inner lip* spreading as a very thin callus over the parietal wall. *Operculum* unknown.

Diameter, 2 mm.; height, 5 mm.

Animal unknown.

Type in the Tasmanian Museum, Hobart.

Hab.—Snares, in 50 fathoms (Captain Bollons). Tasmania and Australia.

4. **Cerithiopsis crenistria,** Suter, 1907. Plate 14, fig. 19.

Cerithiopsis crenistria, Suter, T.N.Z.I., xxx'x, 1906 (1907), 256, pl. 9, f. 4.

Shell small, turriculate, imperforate, thin and semitransparent, ornamented with numerous nodules; aperture small, terminating in a short and widely open canal. *Sculpture* formed by 2 low spiral ribs, which are crossed by equidistant axial costæ, 12 on the last whorl, which do not reach the suture; the crossing-points of the two kinds of ribs are raised to very distinct nodules, first round, oval on the later whorls. *Colour* very light brown, shining. *Spire* high, turriculate. *Protoconch* of a lighter colour, 1½ whorls, top flattened, radially striate, and on the periphery with a row of elongated small nodules. *Whorls* 9, the second has a slightly greater diameter than the third; sides biangulate, nearly straight; base flat, depressed round the canal. *Suture* very distinctly impressed, margined below by a small thread. *Aperture* subquadrate, produced into an open and short canal, which is a little turned to the left and backward. *Outer lip* sharp, but little convex. *Basal lip* concave. *Columella* slightly concave, the inner lip spreading as a very thin, narrow, and whitish glaze over it. *Operculum* unknown.

Diameter, 3 mm.; height, 8 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Hauraki Gulf, near Channel Island, in 25 fathoms, one specimen (type); Snares, in 50 fathoms (Captain Bollons).

Remarks.—I do not think this specimen is adult. It is larger and less subulate than *C. sarissa,* Murd.

5. **Cerithiopsis marginata,** Suter, 1908. Plate 14, fig. 20.

Cerithiopsis marginata, Suter, P. Mal. S., viii, 36, pl. 3, f. 44.

Shell very small, subulate, solid. *Sculpture* consisting of 2 broadly rounded cinguli, the last 2 whorls with a narrow thread margining the suture, and 2 additional narrow and smooth keels on the body-whorl bounding the smooth base; axial sculpture formed by straight, equidistant, and rather broad riblets, about 20 on the last whorl; crossing-points produced into rounded gemmules. *Colour* white. *Spire* elevated conic, much higher than the aperture; outlines faintly convex. *Protoconch* papillate, the nucleus globular, of 1½ smooth and polished whorls. *Whorls* about 8, regularly increasing, the upper ones somewhat convex, the others flattish; base slightly concave. *Suture* impressed, margined on the last whorls. *Aperture* subquadrangular, produced into a short and open canal, not notched at its base. *Outer lip* nodulous on the outside. *Basal lip* sinuate. *Columella* subvertical, straight, truncated below by the oblique upper margin of the canal. *Operculum* unknown.

Diameter, 1 mm. ; height, 2·7 mm.
Animal unknown.
Type in my collection.
Hab.—Snares, in 50 fathoms (Captain Bollons).

6. Cerithiopsis sarissa, Murdoch, 1905. Plate 14, fig. 21.

Cerithiopsis sarissa, Murdoch, T.N.Z.I., xxxvii, 1904 (1905), 221, pl. 7, f. 8, 9.

Shell small, narrow, tapering to a slender point, with spiral and slightly weaker axial riblets. *Sculpture :* Apical whorls smooth, the succeeding with 3 spiral and numerous slightly oblique longitudinal riblets forming rows of gemmules ; on the lower whorls the suture is margined with a minute beaded riblet ; this gradually strengthens, and on the last whorl forms a fourth spiral, with the beadings less marked than on the rows immediately above ; beneath this a shallow groove, thence gently curved to the columella, and curving obliquely around the latter is a minute ridge which terminates at the canal ; of the 3 spiral rows of gemmules the 2 lower are the largest, and about equal to the interspaces ; on the last whorl there are about 17 to 20 gemmules per row ; they are somewhat oval, shining, and variously coloured. *Colour* light or dark brown, somewhat shining, the suture of the lower whorls, fourth spiral on the last, and base dark-purplish ; gemmules on the last whorl light brown, pale chestnut, and purple. *Spire* high and narrow, about three times the height of the aperture ; outlines nearly straight. *Protoconch* small, of 3½ smooth convex whorls, nucleus oblique. *Whorls* 11–12, flatly convex, regularly increasing ; base slightly concave, smooth. *Suture* deep. *Aperture* ovate, angled above, with a very short, slightly oblique, and deeply notched canal. *Outer lip* thin and sharp, angled at the junction with the basal lip. *Columella* short, nearly straight, inflexed towards the canal. *Operculum* unknown.

Diameter, 1·8 mm. ; height, 6·25 mm.
Animal unknown.
Type in the Dominion Museum, Wellington.
Hab.—Whangaroa Harbour, type (C. Traill) ; Kawhia Harbour, immediately within the entrance, on rocks at low tide (R. Murdoch) ; Plimmerton, Cook Strait ; off Otago Heads, dredged (A. Hamilton) ; Bounty and Snares Islands, in 50 fathoms (Captain Bollons) ; Banks Peninsula, under stones and on seaweeds (Iredale).

7. Cerithiopsis styliformis, Suter, 1908. Plate 14, fig. 22.

Cerithiopsis styliformis, Suter, P. Mal. S., viii, 36, pl. 3, f. 43.

Shell small, acicular, almost cylindrical, rather thin. *Sculpture* consisting of 3 cinguli, the uppermost close to the suture and less elevated ; a fourth smooth keel on the last whorl, continued from the suture ; crossed by straight axial riblets, about 15 on the last whorl ;

the points of intersection raised to conspicuous rounded gemmules on the second and third keel, the first, however, remaining nearly smooth. *Colour* yellowish-brown, the first 3 whorls slightly darker. *Spire* high, subcylindrical, but tapering toward the apex, very much higher than the aperture; outlines straight. *Protoconch* papillate, of 1½ smooth, convex, and shining whorls. *Whorls* 8 to 9, regularly increasing, convex; base slightly concave and smooth. *Suture* impressed. *Aperture* vertical, subquadrangular, produced below into a very short, open, and emarginate canal. *Outer lip* sharp, sinuated on the outside by the spiral keels. *Columella* vertical, straight above, bending over in a curve to the canal below. *Operculum* unknown.

Diameter, 1·1 mm.; height, 3·7 mm.

Animal unknown.

Type in my collection.

Hab.—Snares, in 50 fathoms (Captain Bollons).

8. **Cerithiopsis subantarctica,** Suter, 1908. Plate 14, fig. 23.

Cerithiopsis subantarctica, Suter, P. Mal. S., viii, 35, pl. 3, f. 41.

Shell very small, subulate, rather solid. *Sculpture* consisting of 3 cinguli, equidistant, with a fourth keel on the last whorl; crossed by oblique axial riblets, 18 to 20 on the last whorl; the points of intersection raised into very prominent gemmules. *Colour* light brown. *Spire* elevated conical, much higher than the aperture; outlines straight or faintly concave. *Protoconch* polygyrate, of 4 smooth and convex whorls. *Whorls* about 11, first slowly increasing, slightly convex; base concave. *Suture* impressed, not margined. *Aperture* vertical, quadrangular, produced below into a short open canal. *Outer lip* sharp, denticulated on the outside by the gemmules. *Columella* vertical, sinuate, rounded, terminating in a point below. *Operculum* unknown.

Diameter, 1·5 mm.; height, 4·8 mm.

Animal unknown.

Type in my collection.

Hab.—Snares, in 50 fathoms (type); Bounty Islands, in 50 fathoms (Captain Bollons).

Genus 2. Newtoniella. Cossmann, 1893.

Newtoniella, Cossmann, Mem. Soc. Roy. Malac. Belg., xxviii, 18. Type: *Cerithium metula*, Lovén. *Lovenella*, Sars, 1878; not of Hicks, 1869. *Cerithiella*, Verrill, 1882; not of Morr. & Lyc., 1850. *Newtonia*, Cossmann, 1891; not of Schlegel, 1866. *Cerithiolinum*, Locard, 1903.

Shell small, conical, with sharp apex; spire long, subulate; protoconch mamillate, of 2 subglobose whorls; whorls numerous, narrow, suture indistinct, with arcuate axial riblets, crossed by spiral unequal threads which crenulate the axial sculpture; last whorl short in proportion, angular at the periphery of the base, which is plane, smooth

or rayed by growth-lines to the excavation above the fasciole corresponding to the growth of the basal notch; aperture small, quadrangular, terminating at the base in an obliquely twisted canal, which is notched; outer lip a little incurved, not produced below, but recurved at the origin of the canal; columella strongly excavated above, twisted below by a prominent and subcarinated fold which follows the inflection of the canal; inner lip somewhat callous, well applied upon the base, and merging into the fasciole of the neck.

Fossil from the Cretaceous.

The columella is too much twisted and the anterior canal is too long to enable *Newtoniella* to be confounded with *Cerithiopsis*, which has, typically, merely a rudimentary notch on the anterior margin of the aperture. (Harris.)

1. **Newtoniella stiria,** Webster, 1906. Plate 14, fig. 24.

Newtoniella stiria, Webster, T.N.Z.I., xxxviii, 1905 (1906), 307, pl. 38, f. 5, *a*, *b*.

Shell acicular, pale yellow, vitreous, with numerous flat whorls. *Sculpture* consists of 3 faintly jewelled spirals to each whorl except the last, which has 4. *Colour* of dead shell pale yellow. *Spire* long and subulate, much higher than the aperture; outlines straight. *Protoconch* with 3 whorls, the first smooth and oblique, the 2 succeeding first radially finely ribbed, then cancellated by spiral striations; the apex diminishes in diameter with the beginning of the definite sculpture. *Whorls* 20, flat; base flat, concave at the base of the canal. *Suture* scarcely marked. *Aperture* quadrangular, canal sharply turned to the left. *Columella* white, twisted. *Operculum* unknown.

Diameter, 2 mm.; height, 9 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms (type); Hauraki Gulf, near Channel Island, in 25 fathoms.

Genus 3. Seila, A. Adams, 1861.

Seila, A. Adams, A.M.N.H., vii, 1861, 130. Type: *S. dextroversa*, Adams and Reeve. *Cinctella*, Monterosato, 1884. *Viriola*, Jousseaume, 1884; **not of Tryon, 1887.**

Animal having a short, broad foot, indented in the middle line in front, with a square-edged mentum narrower than the foot and extending beyond it. The tentacles are very short and stout, the proboscis seldom protruded; there is no muzzle like that of *Cerithium*. The jaw is composed of spade-shaped, rather large, close-set horny plates, the points projecting. The central tooth of radula is subrectangular, wider than high, with 2 widely separated, strong, sharp cusps, and a much feebler, shorter, and smaller one in the middle line between them. The lateral is oblong, not very much wider than high, and has a strong recurved cusp with 1 large and 1 small denticle;

the marginals, higher than wide, have 2 denticles at the point, which is less than half as wide as the base. Formula $\frac{2}{3}+\frac{1}{2}+\frac{1}{3}+\frac{1}{2}+\frac{2}{2}$. (Dall.)

Shell small, fragile, subcylindrical, narrow. Spire long, subulate. Protoconch paucispiral, with a mamillate nucleus, whorls imbricate anteriorly and spirally lirate. Whorls flat, with prominent spiral keels, trellised in the interspaces by fine, crowded growth-lines, which leave no trace on the keels; last whorl but little elevated, carinated at the periphery of the base, which is flattened or even excavated; ornamented with radiate sinuous plications, extending to the edge of the canal, which is formed by growth of the basal notch, and replacing the neck, which is completely absent. Aperture subquadrangular, with a short truncated canal below. Outer lip thin and sharp. Columella very little arcuate. Operculum shaped like a *Carinaria* shell in outline, but somewhat narrower, with the apex free, pointed, and turned to the left. The attached surface is deeply concave.

Distribution.—Tropical, subtropical, and temperate seas.

Fossil.—From the Cretaceous.

KEY TO SPECIES.

A. Penultimate whorl with 3 cinguli.
  a. Body-whorl with 4 cinguli and 1 on the base.
    b. Protoconch of 1½ whorls, bulbose .. .. *bulbosa.*
    bb. Protoconch of 4 whorls, not bulbose .. .. *terebelloides.*
  aa. Body-whorl with 4 cinguli, none on the base .. .. *dissimilis.*
B. Penultimate whorl with 4 cinguli.
  a. Body-whorl with 5 to 6 cinguli, and 1 on the base .. *chathamensis.*
  aa. Body-whorl with 5 cinguli, and 2 on the base .. *cochleata.*

1. Seila bulbosa, Suter, 1908. Plate 14, fig. 25.

Seila bulbosa, Suter, P. Mal. S., viii, 37, pl. 3, f. 46.

Shell small, elongate, many-whorled, with a bulbose apex, rather solid. *Sculpture:* The first 1½ whorls smooth, the following volutions with 3 narrow and rather sharp spiral keels, the upper 2 closer together, last whorl with 5 keels, the lowest of which is upon the base; interstices having fine, dense, straight growth-lines, sometimes oblique near the suture. *Colour* white. *Spire* much higher than the aperture; outlines straight. *Protoconch* globular, of 1½ smooth whorls, the first bulbose, of greater diameter than the next few whorls. *Whorls* about 14, slowly and regularly increasing, flat; base slightly concave. *Suture* very little impressed. *Aperture* subquadrangular, produced below into a short and open canal. *Outer lip* sinuated on the outside. *Lower lip* horizontal, slightly ascending toward the canal. *Columella* short, nearly straight, bent over, and ending in a point below; parietal wall lightly excavated. *Operculum* unknown.

Diameter, 3 mm.; height, about 13 mm. No perfect specimen available.

Animal unknown.

Type in my collection.

Hab.—Snares, in 50 fathoms (Captain Bollons).

2. Seila chathamensis, Suter, 1908. Plate 14, fig. 26.

Seila chathamensis, Suter, P. Mal. S., viii, 37, pl. 3, f. 45.

Shell small, elevated conic, solid. *Sculpture:* First whorl smooth, the succeeding 2 with 2 cinguli, the upper of which is inconspicuous, but the lower one is thick and prominent; the following 5 whorls have 3 rounded cinguli, then there are 4 on the next volutions, and 6 on the last whorl, the lowest being upon the base; the uppermost cingula on the last whorl is usually grooved or divided into 2 narrow cinguli, increasing their number to 7. The interspaces are densely and finely longitudinally striated by growth-lines. *Colour* fulvous. *Spire* high conical, much higher than the aperture; outlines slightly concave below the first 2 whorls, nearly straight further down. *Protoconch* small, depressed, of 1 smooth whorl only. *Whorls* about 13, regularly increasing, the second and third convex, the others flattish; base flat, concave round the canal. *Suture* not much impressed. *Aperture* vertical, subquadrangular, produced below into a very short and open canal, which is slightly turned to the left. *Outer lip* denticulated outside by spiral sculpture, smooth inside. *Basal lip* nearly straight. *Columella* arcuate, bent over at a blunt angle toward the canal. *Operculum* unknown.

Diameter, 3·2 mm.; height, 10 mm.

Animal unknown.

Type in my collection.

Hab.—Foveaux Strait, in 15 fathoms (type); Chatham Islands; Hauraki Gulf (H. S.).

3. Seila cochleata, Suter, 1908. Plate 14, fig. 27.

Seila cochleata, Suter, T.N.Z.I., xl, 1907 (1908), 361, pl. 28, f. 3.

Shell small, conic, solid, dark brown. *Sculpture* consisting of flat cinguli, 3 on the 2 whorls succeeding the embryonic shell, 4 on the following 4 whorls, and 5 on the body-whorl, to which are added 2 narrower spirals on the base, the upper of which arises from the suture; all are of about the same strength; the interstices of the same width as the cinguli, ornamented with fine axial striæ; the intercalation of an additional spiral takes place between the first and second rib, and it is at first very thin, but gradually attains the same strength as the others. *Colour* chestnut-brown. *Spire* elevated conic, much higher than the aperture; outlines faintly convex. *Protoconch* broken off in the only specimen I have. *Whorls* about 10, regularly increasing, flat; base somewhat excavated. *Suture* deep, canaliculated by the spiral sculpture. *Aperture* triangularly oval, angled above, produced below into a very short and open canal. *Outer lip* rather thick, denticulated on the outside by the spirals, angularly rounded on meeting the straight basal lip. *Columella* vertical, short, arcuate, thick and rounded, subtruncate below. *Inner lip* narrowly

and thinly spread over the columella and parietal wall. *Operculum* unknown.

Diameter, 3·8 mm. ; height, about 10·5 mm.

Animal unknown.

Type in my collection.

Hab.—Bay of Islands (J. C. Anderson).

Remark.—In sculpture this species equals the Pliocene *Bittium cinctum*, Hutton (which is a *Seila*), but the fossil species has more whorls, is higher, and the outlines of the spire are perfectly straight.

4. **Seila dissimilis**, Suter, 1908. Plate 14, fig. 28.

Seila dissimilis, Suter, P. Mal. S., viii, 37, pl. 3, f. 47.

Shell minute, subcylindrical, rather thin. *Sculpture :* The first 2 whorls are smooth, the succeeding ones have 3 prominent, unequal, equidistant, and flat cinguli, the uppermost narrower, lower, and close to the suture ; the last whorl has a fourth cingulum toward the base, but quite close to the upper one ; indistinct axial riblets and fine growth-striæ are visible in the interstices ; the cinguli on the third to fifth whorl are faintly nodulous, but those on the later whorls remain smooth. *Colour* light yellowish-white. *Spire* high, subcylindrical, much higher than the aperture ; outlines straight. *Protoconch* paucispiral, globose, of 2 smooth and convex whorls. *Whorls* about 6, regularly increasing, very little convex ; base smooth, slightly concave. *Suture* not deep. *Aperture* subquadrangular, with a short and open canal below. *Outer lip* sinuated by the spiral sculpture. *Basal lip* almost straight. *Columella* subvertical, nearly straight, narrowing to a point below. *Operculum* unknown.

Diameter, 0·8 mm. ; height, 2·5 mm.

Animal unknown.

Type in my collection.

Hab.—Snares, in 50 fathoms (Captain Bollons).

5. **Seila terebelloides**, von Martens, 1873. Plate 14, fig. 29.

Cerithium (Bittium) terebelloides, v. Mts., Crit. List, 26. *C. cinctum*, Hutton, C.M.M., 27. *Bittium terebelloides*, v. Mts. ; Hutton, M.N.Z.M., 74.

Shell small, subcylindrical, thin and fragile. *Sculpture* consisting of 3 spiral keels of equal strength, and equidistant on the upper whorls, the last with 4 keels and a fifth below the periphery of the base, which is less elevated ; interstices with fine, sharp, and crowded growth-lines. *Colour* brown or yellowish. *Spire* subulate, much higher than the aperture, sharply pointed. *Protoconch* long, cylindrical, of 4 convex and smooth whorls, the nucleus mamillate. *Whorls* 16, slowly and regularly increasing, flat ; base flattened. *Suture* inconspicuous, situate in a deep channel formed by the spiral keels. *Aperture* subquadrangular, with a very short, open, and slightly oblique canal, which is broadly notched. *Outer lip* thin and sharp, denticulated

on the outside by the spiral keels, but little produced beyond the opposite margin of the canal. *Columella* nearly straight, bent to the left below to form the inner edge of the canal. *Operculum* unknown.

Diameter, 3 mm. ; height, 12 mm.

Animal unknown.

Type in the Kgl. Naturalien Kabinet, Stuttgart.

Hab.—North and South Islands of New Zealand, in 10 to 20 fathoms ; Foveaux Strait ; Whangarei Heads (C. Cooper).

Remarks.—Hutton's name has priority by one month, but the description is quite inadequate, and he himself adopted the name bestowed on the species by von Martens. The type of *C. cinctum*, Hutt., is in the Dominion Museum, Wellington.

Fossil in the Pliocene.

Fam. **TRIFORIDÆ**, Jousseaume.

Shell generally sinistral, but very rarely dextral, elongate, subulate, ornamented with spiral keels, which are either plain, tuberculate, or gemmate ; aperture small, with a more or less recurved canal, generally tubular ; outer lip notched near the suture, sometimes forming an isolated tube, which may be lateral or diametrically opposed to the suture, on the dorsal side.

This family includes the fossil genus *Triforis*, Deshayes, 1834 : and the Recent genera *Triphora*, Blainville, 1828 ; *Viriola*, Jousseaume, 1884 ; and *Sychar*, Hinds, 1844.

Genus 1. Triphora, Blainville, 1828.

Triphora, Blainv., Dict. Sci. Nat., lv, 344. Type : *T. gemmata*, Blainv. (= *tristoma*, Blainv.). *Mastonia*, Hinds, 1844. *Monophorus*, Grillo ; not of Q. and G., 1824. *Biforina*, Bucq., Dollf., & Dautzb., 1884. *Mastoniæforis*, Jousseaume, 1884.

Animal with an elongated foot, truncated in front, where it forms a duplicature, the upper margin less developed than the lower ; tentacles long, cylindrical, united by a sinuated veil, eyes at their exterior base ; snout very short ; operculigerous lobe simple. The radula has the formula 4 + 1 + 1 + 1 + 4 ; the central tooth very short, transverse, multicuspidate ; lateral tooth also transverse and multicuspid ; marginals small, transverse, simple. P. Fischer remarks that the dentition is paradoxical, there being 4 instead of 2 marginal teeth ; but this multiplication of the marginals has also been observed in other genera of the *Tænioglossa*, especially in *Struthiolaria*.

Shell small, always sinistial, conic, sometimes ventricose ; spire high, subulate ; protoconch mostly smooth, elongate, with an obtuse nucleus. Whorls about 15, with 2 or 3 spiral keels, usually closely granulated, the axial ornamentation mostly not continuous from whorl to whorl. Suture usually not deep. Aperture small, with a

tubular, short, basal canal. Outer lip sinuate near the suture, sometimes produced into a canal at the fully gerontic stage. Columella smooth. Operculum paucispiral, with subcentral nucleus.

Nearly two hundred species are now known, inhabiting the West Indies, Europe, Indian Ocean, Polynesia, and Australasia.

Fossil.—Tertiary.

These molluscs often attain a considerable size before losing their larval characters, particularly when distant from the shore.

KEY TO SPECIES.

A. Keels smooth or but slightly nodulous; colour light brown .. *Huttoni.*
B. Keels more or less distinctly gemmate.
a. All the adult whorls with 3 keels, axial and spiral sculpture of about equal strength .. .. *lutea.*
aa. Adult whorls first with 2 then with 3 keels.
b. Outlines of spire convex; shell chequered with brown and white .. .. *ampulla.*
bb. Outlines of spire straight or but very slightly convex.
c. Gemmules not prominent, 18 to 20 on a whorl; shell white .. .. *infelix.*
cc. Gemmules very prominent, high, lower whorls with a median fulvous band, base fulvous .. .. *fascelina.*

1. Triphora ampulla, Hedley, 1902. Plate 15, fig. 2.

Triphora ampulla, Hedley, P.L.S. N.S.W., 1902, 615, pl. 33, f. 38, 39.

Shell small, narrowly conical, acuminate. *Sculpture:* On the first four adult whorls are 2 gemmule rows; on the fifth a small median row is intercalated, which increases till at the last whorl it equals the others; the gemmules are about 18 to a whorl, large and closely set, linked within the row but not vertically; a suprasutural keel below the periphery of the last whorl; 2 plain keels upon the base. *Colour:* Each whorl is chequered by alternate squares of white and chocolate; apex white; base chocolate. *Spire* high, a little less than five times the height of the aperture; outlines moderately convex. *Protoconch:* First whorl smooth, the other three bicarinate, crossed by fine bars. *Whorls* about 13, regularly increasing, flattish; base slightly concave. *Suture* distinct. *Aperture* subquadrate, angled above, produced below into a short, straight, and narrowly open canal. *Outer lip* sharp, with a simple sutural notch; spur of the basal lip not reaching the pillar. *Columella* short, vertical, slightly concave, terminating in a point at the inner margin of the canal. *Operculum* unknown.

Diameter, 1·6 mm.; height, 5 mm. (type).

Animal unknown.

Type in the Australian Museum, Sydney.

Hab.—Takapuna and Narrow Neck Reefs (H. S.); near Little Barrier Island, in 20 fathoms (R. H. Shakespear).

The type is from Watson's Bay, Port Jackson.

2. Triphora fascelina, Suter, 1908. Plate 15, fig. 4.

Triphora fascelina, Suter, P. Mal. S., viii, 38, pl. 3, f. 49.

Shell small, slender, and narrow. *Sculpture:* The polygyrate protoconch has the first whorl smooth, the second microscopically finely spirally striate, and the remaining three whorls axially plicated and slightly angled at the periphery; the next seven whorls have two equal keels, but the later whorls have a fine spiral thread intercalated between them; all these keels are crossed by about 15 axial riblets, the points of intersection raised into rounded gemmules; a fourth suprasutural keel below the periphery of the last whorl, and 2 upon the base. *Colour* of protoconch light brown, the other whorls white with a central fulvous spiral band on the lower whorls; base fulvous. *Spire* high, conical; outlines slightly convex. *Protoconch* high, of 5 convex subangled whorls, the nucleus globose. *Whorls* about 15, regularly increasing, flattish; base flat. *Suture* impressed, sometimes lightly margined by the suprasutural keel. *Aperture* vertical, subquadrate, with a short, straight, and narrowly open canal below, its base slightly emarginate. *Outer lip* thin, sharp, sinuated by the spiral sculpture, with a shallow sutural sinus. *Columella* vertical, slightly arcuate, ending in a point upon the inner margin of the canal. *Operculum* unknown.

Diameter, 1·6 mm.; height, 4·8 mm. (shell of 15 whorls).

Animal unknown.

Type in my collection.

Hab.—Snares, in 50 fathoms (type); Bounty Islands, in 50 fathoms (Captain Bollons); near Cuvier Island, in 38 fathoms (Captain Bollons).

Remarks.—The species is nearly allied to *T. innotabilis*, Hedley, from Sydney Harbour, which, however, is brown, the gemmules white and more numerous, and the spur of the basal lip is crossing the pillar.

3. Triphora Huttoni, Suter, 1908. Plate 15, fig. 1.

Triphora Huttoni, Suter, P. Mal. S., viii, 38, pl. 3, f. 48. *Cerithium* (*Ino*) *minimus*, Hutton, C.M.M., 27. *Triforis Angasi*, Crosse: von Martens, Errata and Addenda to C.M.M., 1874, 2; Hutton, J. de Conch., 1878, 26. *Triphoris Angasi*, Crosse: Hutton, M.N.Z.M., 75; P.L.S. N.S.W., ix, 936: Index, 76, not of Crosse.

Shell small, acicular, rather fragile, slightly polished. *Sculpture:* The first whorl smooth, the next one or two with 2 keels, succeeding whorls with 3, the last with 4 keels, and 1 upon the base; sometimes the last two to four whorls bear 4 keels, the lowest of which, however, may be reduced to a suprasutural thread; the axial sculpture is variable — fine growth-lines in the interstices between the keels, or distinct threads passing over the keels, very often rendering them moderately nodulous. *Colour* light brown. *Spire* high, subcylindrical; outlines straight. *Protoconch* of 1 broadly convex whorl.

Whorls about 11, regularly increasing, almost flat. *Suture* not much impressed. *Aperture* broadly oval, vertical, angled above, produced below into a short, slightly recurved, and narrowly open canal, its base not emarginate. *Outer lip* sharp, sinuated by the spiral sculpture, with a shallow sutural sinus. *Columella* short, perpendicular, bent off and drawn out to a point upon the inner margin of the canal. *Operculum* unknown.

Diameter, 1·5 mm.; height, 5·25 mm. (one of the types with 11 whorls).

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Stewart Island, in 30 fathoms (type); Whangaroa Harbour (C. Traill); Bounty and Snares Islands, in 50 fathoms (Captain Bollons); Whangarei Heads (C. Cooper).

Remarks.—The specific name *minima* being preoccupied in *Triphora* by Pease, 1870, I changed it to *T. Huttoni*. The nearly allied Australian *T. Angasi*, Crosse, has a much more prominent axial sculpture, the cinguli are gemmate, and the base has 2 keels. *T. Kesteveni*, Hedley, from Sydney Harbour, is another nearly related form.

4. Triphora infelix, Webster, 1906. Plate 15, fig. 3.

Triphora infelix, Webster, T.N.Z.I., xxxviii, 1905 (1906), 307, pl. 38, f. 6, 6*a*.
Triforis gemmulata, Adams and Reeve: von Martens, Crit. List, 1893.
Triphoris gemmulatus, Ad. & Rve.: Hutton, M.N.Z.M., 75; P.L.S. N.S.W., ix, 937, Index, 76, not of Adams and Reeve.

Shell small, subulate, rather fragile. *Sculpture:* The 5-whorled protoconch has the nucleus smooth, the other whorls acutely angled and axially microscopically striated; the next four whorls have 2 keels; on the ninth or tenth whorl a third keel is introduced between the other two, which at first is more slender than the others, but gradually increases in width; these are crossed by 18 to 20 axial riblets, mostly slightly oblique, the crossing-points raised into roundish not very prominent gemmules; the last whorl with a smooth suprasutural keel, at which the axial sculpture stops, and 2 keels upon the base. *Colour* white. *Spire* very high; outlines almost straight. *Protoconch* conic, nucleus small, globose. *Whorls* 15 to 18, regularly increasing, flat; base slightly concave. *Suture* impressed, sometimes margined above by a fine thread. *Aperture* subquadrate, produced below into a short and open canal, slightly bent to the right, with an emarginate base. *Outer lip* thin and sharp, sinuated, with a distinct sutural notch. *Basal lip* straight, nearly horizontal. *Columella* short, vertical, straight, terminating in a point at the margin of the canal. *Operculum* unknown.

Diameter, 1·5 mm.; height, 6 mm. (type, with 15 whorls). Diameter, 2·2 mm.; height, 8·8 mm. (with 18 whorls, from Stewart Island).

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms (type); near Little Barrier Island, in 20 fathoms (R. H. Shakespear); near Channel Island, Hauraki Gulf, in 25 fathoms; Whangaroa Harbour (C. Traill); Stewart Island.

Remark.—This species is very variable in size.

5. Triphora lutea, Suter, 1908. Plate 15, fig. 5.

Triphora lutea, Suter, P. Mal. S., viii, 39, pl. 3, f. 50.

Shell small, slightly polished, fragile, slender. *Sculpture:* The protoconch is smooth, with 2 keels, the lower of which is much more prominent; the adult whorls have 3 keels, the uppermost a little narrower; these are crossed by about 16 axial riblets, with deep and slightly narrower interstices between them; the crossing-points produced into rounded, not very prominent, nodules; on the last whorl there is a fourth suprasutural smooth keel, and 2 upon the base. *Colour* light orange, white toward the apex; old dead shells are dull white. *Spire* subulate; outlines straight. *Protoconch* consisting of 3 whorls, the nucleus pointed and slightly oblique. *Whorls* about 10, regularly increasing, lightly convex; base moderately convex. *Suture* deep, sometimes margined by a suprasutural thread. *Aperture* vertical, ovate, angled above, produced below into a straight, short, and open canal, but faintly emarginate at the base. *Outer lip* sharp, slightly sinuate, with a shallow sutural sinus. *Columella* perpendicular, narrowed below to a point. *Operculum* unknown.

Diameter, 1·8 mm.; height, 5·5 mm. (shell of 10 whorls).

Animal unknown.

Type in my collection.

Hab.—Snares, in 50 fathoms (type); Bounty Islands, in 50 fathoms (Captain Bollons).

Fam. **VERMETIDÆ**, d'Orbigny.

Tubulibranchiata, Cuvier, 1830. *Tubispirata*, Deshayes, 1830. *Protopoda*, Gray, 1837.

Animal vermiform, elongated, with short snout and 2 distant short pedal tentacles, one on each side of the suprapedal gland, bearing eyes at their outer bases; foot small, discoidal; a single elongated branchia; no copulatory organ; 2 corneous jaws. Radula having the formula 2+1+1+1+2; the central tooth trapezoidal, multicuspidate, the median cusp large and pointed; lateral teeth multicuspidate; marginals with 1 or 2 lateral cusps.

Shell tubular, sometimes septate within, attached or free; sometimes regularly spiral when young, always becoming irregular in the adult growth; aperture rounded, usually entire, sometimes fissured. Operculum corneous, annular, sometimes spiral, rarely absent.

These animals, generally attached upon stones, shells, or coral, or living in sponges, often gregarious in large colonies, although without copulatory organs are unisexual, oviparous or viviparous. The

eggs are often attached to the shell itself. The embryos are furnished with a spiral shell, and the young are often perforating.

Fossil.—Secondary and Tertiary.

The *Vermetidæ* are exceedingly irregular in growth, sculpture, and colouring, often reproducing the surface upon which they are fixed. There is a great resemblance of some of the forms to Annelids (*Serpulidæ*), from which they may be distinguished by the spiral nuclear shell and interior septa of the tube. The tube of the Annelids is composed of 2 calcareous layers; that of *Vermetidæ* of 3.

Key to Genera.

A. Shell-tube with a longitudinal fissure, simple or formed by a series of perforations .. .. Siliquaria.
B. Shell-tube without longitudinal fissure or perforations.
a. Operculum present.
b. Operculum concave, with plain margin .. .. Siphonium.
bb. Operculum slightly concave, with horny bristles .. Stephopoma.
aa. No operculum. Shell-tube with more or less distinct longitudinal liræ, sometimes decussated .. .. Serpulorbis.

Genus 1. Serpulorbis, Sasso, 1827.

Serpulorbis, Sasso, in "Giornale Ligurico," Genua, 1827, 482. Type: *S. polyphragma*, Sasso. *Thylacodes*, Guettard, 1774. *Serpulus*, Montfort, 1810; not *Serpula*, Linné, 1758. *Limentina*, Risso, 1826. *Cellularia*, Schmidt, 1833. *Cladopoda*, Gray, 1840. *Hatina*, Gray, 1842. *Serpuloides*, Gray, 1850. *Tetranemia*, Mörch, 1859.

Shell adherent, frequently solitary, tubular, irregularly twisted, with 3 to 5 longitudinal nodulous liræ; aperture rounded, without internal longitudinal plications, but frequently partitioned perpendicularly to the axis. No operculum, or minute when present.

Guettard established his genus chiefly on account of the internal septa, the presence of which in his genus *Campulotus* was unknown to him.

Key to Species.

a. Shell with distinct moniliform longitudinal ribs and transverse growth-lines; no internal septa .. .. *sipho.*
b. Shell sometimes with longitudinal striæ and rugose growth-marks; internal septa present .. .. *zelandicus.*

1. Serpulorbis sipho, Lamarck, 1818. Plate 40, fig. 9.

Vermetus sipho, Lamk., A.s.V., v, 626. *Serpulus sipho*, Hedley, P.L.S. N.S.W., 1902, 602. *Vermetus arenarius*, Lamk.: Q. & G., Voy. Astrol., iii, 289, pl. 67, f. 8–10; not of Lamarck. *V. dentiferus*, Lamk.: Q. & G., *t.c.*, 291, pl. 67, f. 27, 28; not of Lamarck. *V. novæ-hollandiæ*, Rousseau, in Chenu, Illustr. Conch., 1847, pl. 1, f. 4*a*; Man. Conch. (1), viii, 179, pl. 53, f. 64. *Cladopoda monilifera*, Hutton, C. Tert. M., 13; Plioc. M., 66, pl. 8, f. 70. *Thylacodes sulcatus*, Tate and May, P.L.S. N.S.W., 1901, 377; not of Lamarck. *Vermicularia novæ-hollandiæ*, Rouss., Index, 76.

Shell large, vermiform, subsolitary or agglomerated, irregularly twisted, brownish. *Sculpture* consisting of rugose growth-striæ,

crossed by unequal longitudinal lines and riblets, mostly distinctly moniliform; the longitudinal sculpture is predominant, but very often the surface is irregularly reticulated by the distinct growth-marks. There are no internal septa, and no operculum. Transverse section subcircular.

Animal having a long and oval cephalic shield; tentacles short, with the eyes at a certain distance from the base; 2 small and rather short tubercles in front of the mouth; foot extending beyond the head, cross-shaped. The whole of the body is light brown, the foot with white spots in front; the mantle is white, its margin brown. (Q. & G.)

Type in the Mus. Hist. Nat., Geneva.

Hab.—North and South Islands, from between tide-marks to about 25 fathoms; Chatham Islands.

The type is from Australia, and it occurs also in Tasmania.

Fossil in the Pliocene and Miocene.

2. **Serpulorbis zelandicus**, Quoy and Gaimard, 1834. Plate 40, fig. 10.

Vermetus zelandicus, Q. & G., Voy. Astrol., iii, 293, pl. 67, f. 16, 17. *Cladopoda zelandica*, Q. & G.: Mörch, J. de Conch., vii, 349. *Vermetus novæ-zealandiæ*, Q. & G.: Gray, Figs. Moll. Anim., ii, 28, pl. 56, f. 6. *Vermetus* (*Bivonia*) *neozelanicus*, Q. & G.: Hutton, P.L.S. N.S.W., ix, 942. *V.* (*Thylacodes*) *zelandicus*, Gray, Man. Conch. (1), viii, 182, pl. 54, f. 81. *Vermicularia zelandica*, Q. & G., Index, 76.

Shell moderately large, vermiform, agglomerated, the first few whorls spirally coiled up, then more or less irregularly twisted; the protoconch small, smooth, globular. *Sculpture* consisting of irregular transverse rugose growth-marks; the longitudinal striæ are inconspicuous or absent altogether. Internal septa are present. Transverse section circular. No operculum.

Animal with the head blackish, with red spots; margin pale yellow; foot spotted with red. The head is yellowish behind, brown and dotted with red in front; mantle broadly bordered with orange.

Type in the Mus. Hist. Nat., Paris.

Hab.—Bay of Islands, type (Q. & G.).

Genus 2. Siphonium, Mörch, 1859.

Siphonium, Mörch, J. de Conch., vii, 1859, 353. Type: *Vermetus maximus*, Sow. *Stoa*, de Serres, 1855 (in part).

Shell adherent, irregularly twisted, carinated, without internal armature. Operculum large, smooth, circular, concave externally, the scar of attachment central, with rugose concentric striæ, and plain margin; the whole surface covered with microscopic siliceous spiculæ, not horny as in *Stephopoma*.

1. Siphonium lamellosum, Hutton, 1873. Plate 40, fig. 11.

Siphonium lamellosum, Hutt., C.M.M., 30; J. de Conch., xxvi, 29; M.N.Z.M., 85. *Vermetus (Siphonium) lamellosus*, Hutton, Man. Conch. (1), viii, 184; P.L.S. N.S.W., ix, 942. *Vermicularia lamellosa*, Hutt., Index, 76.

Shell thick, irregularly twisted, with numerous imbricating transverse ridges, which are often reflexed, and obsoletely carinated. *Aperture* circular; internal septa are present. *Operculum* hemispherical.

Diameter of aperture, 5 mm.

Type in the Dominion Museum, Wellington.

Hab.—Cook Strait, in deep water (type); Chatham Islands; Bay of Islands (J. C. Anderson).

Remark.—May be attached to other bodies, or forming unattached large masses.

Genus 3. Stephopoma, Mörch, 1860.

Stephopoma, Mörch, J. de Conch., 1860, 42. Type: *Vermetus roseus*, Q. & G

Adult shell adherent, spiral, solitary or clustered; aperture slightly inflexed above, very obsoletely effused below, without internal lamellæ. Operculum slightly concave, multiannulate, furnished with long divergent multifid horny bristles.

Recent and fossil.

Key to Species.

a. Whorls not carinated, protoconch smooth; bristles of operculum simple, multifid at base only .. .. *roseum.*

b. Whorls carinated, protoconch minutely granular; bristles of operculum multifid .. .. *nucleogranosum.*

1. Stephopoma roseum, Quoy and Gaimard, 1834. Plate 15, figs. 6, 6*a*.

Vermetus roseus, Q. & G., Voy. Astrol., iii, 300, pl. 67, f. 20–23. *Siliquaria lævigata*, Lamk.: Hutton, C.M.M., 31, not of Lamarck. *Vermetus (Stephopoma) roseus*, Q. & G.: v. Martens, Crit. List., 28. *Stephopoma roseum*, Q. & G.: Hutton, M.N.Z.M., 85; Man. Conch. (1), ix, 185, pl. 55, f. 94. *Vermicularia rosea*, Q. & G., Index, 76.

Shell cylindrical, vertical; spiral sometimes very loosely coiled, or the volutions are close together, giving the shell a *Cyclostoma*-like appearance; surface rugose, nucleus smooth. *Colour* pink, dead shells white to brown, white in alcohol. *Operculum* circular, brown, with numerous horny divergent and multifid corneous bristles. According to the figure given by Quoy and Gaimard, the bristles are multifid at their base, with a long simple median bristle.

Length of shell, 13–18 mm.

Animal having the foot long, cylindrical, with the operculum at its extremity. In front of the snout is a median vertical funnel-shaped appendix, which can be stretched out. Foot with a small

pointed tubercle on the right side. Head elongated, tentacles very short, eyes at their base outside. The respiratory cavity is ample, branchia yellow, extending exteriorly above the mantle. The whole animal black, with yellowish.

Type in the Mus. Hist. Nat., Paris.

Hab.—Thames River, in considerable depth, type (Q. & G.); Rangitoto Channel, in 4 fathoms (H. S.).

2. Stephopoma nucleogranosum, Verco, 1904. Plate 15, figs. 7, *a*, *b*.

Stephopoma nucleogranosum, Verco, T.R.S. S.Aust., xxviii, 1904, 143, pl. 26, f. 11–13; Suter, T.N.Z.I., xxxviii, 328.

Shell attached, solitary, or conglomerate. *Nucleus* horn-coloured or white; nautiloid, of $1\frac{1}{2}$ turns; diaphanous, slightly effuse at its aperture; covered with minute granules, arranged in crowded lines corresponding with the accremental lines. The shell springs from within the slightly trumpet-shaped mouth, which projects all round and marks off the embryonic shell from the next whorl: $2\frac{1}{2}$ of these follow in the same plane, rather rapidly enlarging, and attached to the surface on which the shell rests; then come 1 or 2 whorls, coiled above and adhering to those below; and, finally, a free more or less twisted tube, varying up to 1 in. in length. The attached whorls along their outer under-surface throw out numerous scales of attachment at irregular intervals. The adherent whorls have a pronounced rounded carina along their upper outer part, which gradually becomes less valid along the free tube, until it may be indistinguishable. From this carina the side is flat to the carina of the whorl below, so that a young shell has the shape of a short cylinder fixed by one end on the rock, &c. There are moderately developed accremental striæ, which become ruder and rounder on the free tube. *Aperture* circular, or very slightly elliptical. *Colour* translucent white; some are tinged more or less with pinkish-chestnut. *Operculum* horny, multiannulate; nucleus central, setigerous. *Setæ* comparatively narrow beyond the base of attachment, then flatly expanded, with numerous (perhaps 8) fine setæ on either side; beyond these the seta bifurcates—one part continues nearly in the same axis, and is the larger and longer; the other stands out at an acute angle, and generally divides into two. Resting on the operculum, in the throat of the shell, may be 3 or 4 embryos, like minute nautilus. (Dr. Verco.)

Cylindrical portion about 6 mm. in diameter and 4 mm. or 5 mm. high; aperture, 3–4 mm. in diameter.

Type in the collection of Dr. J. C. Verco, Adelaide.

Hab.—Takapuna Reef, on the under-side of boulders; Rangitoto Channel, in about 5 fathoms (H. S.); Bay of Islands.

The type is from Blackstairs Passage, South Australia, in 16–23 fathoms.

Fossil in the Pliocene of Wanganui.

Genus 4. Siliquaria, Bruguière, 1789.

Siliquaria, Brug., Encycl. Méth., i, p. xv. Ex.: *S. australis*, Q. & G. *Tenagode*, Guettard, 1774: Guettard did not adopt the Linnean nomenclature, and it seems unsettled that he used any Latin name for the genus (Dall).

Animal with rudimentary pedal tentacles; mantle slit along the branchial cavity.

Shell tubular, at first spiral, afterwards protracted and irregular; tube with a longitudinal fissure, which is sometimes simple, sometimes formed by a series of perforations; often both varieties exist in the same specimens. Aperture circular, without internal septa or lamellæ. Operculum corneous, subcylindrical or conoidal, formed of a spirally rolled band, with ciliated margin; axis of the cone filled up internally by a series of spiral radiating cells.

Distribution.—Mediterranean, west Africa, tropical Pacific Ocean, Australasia.

Fossil.—One species from the Upper Cretaceous and about twenty from the Tertiary are known. The typical species, as well as several others, occur imbedded in sponges.

The Recent species are tropical and subtropical in distribution. They live on rocks and corals, and sometimes in sponges.

Sect. 1. Agathirses, Montfort, 1810.

Agathirses, Mtft., Conch. Syst., i, 398. Ex.: *S. striata*, Defrance.

Slit composed of numerous isolated holes.

1. Siliquaria Cumingi, Mörch, 1860. Plate 15, fig. 8.

Tenagodes (*Siliquaria*) *Cumingi*, Mörch, P.Z.S., 1860, 403. *Siliquaria Cumingi*, Mörch, Man. Conch. (1), ix, 190, pl. 57, f. 19; pl. 58, f. 21. *Tenagodes Cumingi*, Mörch, Index, 76.

Whorls 5, the first scalariform, angulated behind, the angle evanescent in the last whorl, granularly lirate below, liræ distant, the interstices with intervening lirulæ, externally transversely lightly fissured, the fissure evanescent in the last whorl, umbilical region longitudinally undulately striate, decussated by sigmoid distant radiating sulci; *slit* at first closed, afterwards with open round holes, which finally coalesce into a denticulated open slit (Tryon).

Type in the British Museum (?).

Hab.—A specimen from Auckland is in the Canterbury Museum.

The type is from the Philippines.

Remark.—I am inclined to consider the specimen in the Canterbury Museum as a variety of the next species.

Sect. 2. Pyxipoma, Mörch, 1860.

Pyxipoma, Mörch, P.Z.S., 1860, 409. Ex.: *S. multistriata*, Defrance (Eocene).

Slit closed by a lamella, but not filled up outside; open near the mouth.

2. Siliquaria Weldii, T.-Woods, 1876. Plate 39, fig. 15.

Siliquaria Weldii, T.-Woods, P.R.S. Tasm., 1875 (1876) 44; Man. Conch. (1), ix, 191, pl. 58, f. 28. *Tenagodes Weldii*, T.-Woods, Index, 76.

Shell graceful, smooth or very lightly longitudinally striated; whitish, yellowish, or very light rosy; first three whorls with the slit filled below, afterwards it is open (Tyron). The first two or three whorls are scalariform, disconnected; the well-marked growth-lines are very distinctly sigmoid on the outer side of the tube, and there are numerous narrow and fine transverse fissures on the outer margin of the slit.

The longest specimen in my collection is 30 mm.

Type in the Tasmanian Museum, Hobart.

Hab.—Chatham Islands (Dr. A. Dendy); Hauraki Gulf (H. S.); off Waipapa Point, in 25 fathoms (E. R. Waite).

Fam. CÆCIDÆ, Gray.

Animal with a long flat rostrum; tentacles cylindrical, with sessile eyes at their outer base; mantle thick, fleshy, circular, closely embracing the neck; a single branchial plume; foot short, narrow, truncated in front, attenuated and obtuse behind. Dentition 2 + 1 + 2 (?).

Shell tubular, with a spiral plane nucleus, which is caducous or persistent, then becoming cylindrical, curved, terminating in a simple circular aperture, the posterior portion of the tube usually divided by one or more septa. Operculum horny, multispiral, margin sometimes fimbriated.

There are usually three stages of growth in the shell of *Cæcum*—first, the spiral or nuclear, soon lost by truncation, the end of the remaining tube closed by a septum; second, the adolescent stage, a curved tube, also lost subsequently; and, third, the adult tube, of similar curved shape, and again closed behind by a septum.

Distribution.—Temperate and warm seas throughout the world, but absent in cold water. About 200 nominal species have been described.

Fossil.—Tertiary.

Genus 1. Cæcum, Fleming, 1817.

Cæcum, Fleming, Encycl. Edinb., vii, 1817, 67. *Cornuoides*, Brown, 1827. *Brochus*, Brown, 1829. *Odontina*, Zborzewsky, 1834. *Odontidium*, Philippi, 1836. *Cæcalium*, Macgillivray. *Corniculina*, Münster. *Dentaliopsis*, Clarke. *Brochina*, Gray, 1857.

Shell when young discoidal, when adult decollated, tubular, cylindrical, arcuated; aperture round, entire; apex closed by a mamillated septum, marking the point at which the original spire has been cut off.

Vernacular Name.—Blind-shell.

1. Cæcum digitulum, Hedley, 1904. Plate 15, fig. 9.

Cæcum digitulum, Hedley, Rec. A.M., v, 94, f. 21 in text; Iredale, T.N.Z.I., xl, 384.

Shell small, smooth save for very slight growth-lines, thin, opaque dull white, slightly curved, tapering rapidly. *Aperture* circular, slightly everted. Septum subungulate. (Hedley.)

Diameter—Maj., 0·5 mm.; min., 0·3 mm.: length, 2·3 mm.

Animal unknown.

Type in the Australian Museum, Sydney.

Hab.—Lyall Bay, Cook Strait (type); Foveaux Strait (A. Hamilton); Lyttelton Harbour, under stones at high-water mark (Iredale).

Remarks.—The rapidity with which this species tapers is an unusual feature (Hedley). The majority of the shells do not taper as rapidly as Hedley's description would imply, nor as his figure shows (Iredale).

Fossil in the Pliocene of Wanganui.

Fam. **TURRITELLIDÆ**, Clark.

Animal with a large and prominent head; rostrum short and broad; tentacles long, subulate, and diverging, the eyes slightly prominent at their external base; mantle-margin fringed, with a siphonal fold on the right side; no siphon; branchial plume single, very long; foot very short, truncate in front, attenuated and obtuse behind, grooved beneath; operculigerous lobe simple. The lingual dentition is very variable; the marginals may be absent, or their number varying from 1 to 3. (Man. Conch. (1), ix, 192.)

Shell long, attenuated, many-whorled, not umbilicated, sculptured with spiral striæ or ridges, lines of growth arched and sinuous; aperture rounded or subquadrate, entire; lip thin, externally flexuous, not thickened. Operculum multispiral.

Distribution.—Found in most seas, from low-water mark to deep water.

Fossil from the Trias.

Genus 1. Turritella, Lamarck, 1799.

Turritella, Lam., Mém. Soc. Hist. Nat. Paris, 1799, 4. Type: *Turbo terebra*, L.

Shell pyramidal, the numerous whorls spirally striated or ridged, crossed by arcuated growth-lines; spire very high, aperture oval or subquadrangular, entire, lip thin. Operculum with fimbriated margin.

Over a hundred species are known, inhabiting all seas, but principally tropical and subtropical. The fossils number about 400 species; the genus commenced in the Trias.

Vernacular Name.—Screw-shell.

Sect. 1. Colpospira, Donald, 1900.

Colpospira, Donald, P. Mal. S., iv, 51. Type: *Turritella runcinata*, Watson.

Shell having the aperture subquadrate, rather longer than wide; outer lip arched obliquely backwards above a deep sinus, then produced prominently below the sinus, and curved round to meet the columella, where it is slightly canaliculated.

Distinguished from the type and other sections of *Turritella* by the deep sinus in the outer lip, by the lower part of the lip being more produced forwards, by the columella being longer and nearly straight, and by the aperture being slightly channelled below.

Key to Species.

a. Shell with 1 prominent spiral cord on the lower whorls . . . . . *pagoda.*
b. Shell with 2 prominent spiral cords on all the post-nuclear whorls; angle of spire, 15–18° . . . . . *fulminata.*
c. Shell with 3 prominent spiral cords on a whorl . . . . *symmetrica.*
d. Shell with 6 prominent spiral cords on a whorl . . . . *chordata.*
e. Shell with 2 principal, 2 secondary, and some finer cords on the lower whorls; angle of spire, 18° . . . . . *Carlottæ.*
f. Shell with 4 principal cords on the fourth to seventh whorl, and 2 strong cinguli on the lower whorls . . . . . *difficilis.*
g. Lower whorls with 2–3 principal and 2–3 secondary cords, besides fine threads; sometimes all of nearly equal strength; angle of spire, 20–22°; shell large . . . . . *rosca.*

1. Turritella Carlottæ, Watson, 1881. Plate 39, fig. 19.

Turritella Carlottæ, Wats., J.L.S., xv, 1881, 222; Chall. Rep., xv, 478, pl. 30, f. 5; Murdoch and Suter, T.N.Z.I., xxxviii, 292; Suter, *t.c.*, 327. *T. vittata*, Hutton, C.M.M., 29; M.N.Z.M., 84; Index, 76; not of Lamarck.

Shell high, narrow, conical, thin, translucent, with fine ruddy spiral threads, a slightly impressed suture, and an angular flattened base. *Sculpture:* Longitudinals—there are fine, thread-like, close-set, curved lines of growth; spirals—there are 2 principal, 2 secondary, and very many minor spirals, but the relative value of these varies a good deal; they are little raised, but distinct; the base is covered with fine crowded spirals, of which those near the edge are stronger than the rest; the microscopic system of spirals is fine, sharp, and distinct. *Colour* yellowish ashy-white, with a suffused ruddy-brown on the upper part of the whorls, and a stronger shade of the same colour defining the more important spirals; the colour becomes altogether paler up the spire, and the apex is white. The *epidermis* is a very thin and delicate calcareous membrane, obviously not extraneous; it adheres to the top of the spirals and stretches across their furrows; it is sparsely cleft by minute gaping rents in the direction of the lines of growth, and the microscopic sculpture of the shell is traceable in it, but rather on its under than its upper surface. *Spire*

very perfectly conical, but the profile-lines are interrupted by the impressed sutures. *Protoconch* small, rounded, smooth, and glossy, consisting of 1½ embryonic whorls; the next whorl is slightly angulated, after which the regular sculpture begins. *Whorls* 15, very slightly convex on the sides, contracting gradually upwards into the suture; towards the bottom of the whorls the contraction into the suture is shorter, straighter, and more rapid; they are of very gradual and regular increase: towards the upper part of the spire the curve of the profile-line of each whorl becomes increasingly stronger: the base is flat, very slightly conical, sharply angulated, and not contracted at the edge. *Suture* very slight, but well defined. *Aperture* small, angularly rounded, a little higher than broad. *Outer lip* is a little drawn in and advancing on the edge of the base, and a little patulous in front of the pillar-point. The generic sinus in the outer lip is parabolic in form. *Columella* a little concave, rather direct, with a thin rounded edge. *Inner lip:* There is not (though the specimens are full grown) even a glaze across the body nor round the base of the pillar, but on older specimens this may probably exist. (Watson.)

Diameter, 7 mm.; height, 24·5 mm. (type). Angle of spire, 15–20°. Penultimate whorl—height, 3·75 mm. Mouth—height, 4 mm.; breadth, 3·5 mm.

Diameter, 11·5 mm.; height, 41 mm. (specimen of 13 whorls, Lyttelton). Diameter, 9 mm.; height, 35 mm. (specimen of 14 whorls, Tauranga). Diameter, 7 mm.; height, 25 mm. (specimen of 12 whorls, Auckland). Diameter, 14 mm.; height, 52 mm. (specimen of 15 whorls, 25 fathoms, Channel Island).

Animal unknown.

Type in the British Museum; of *T. vittata*, Hutt., in the Dominion Museum, Wellington.

Hab.—Queen Charlotte Sound, in 10 fathoms, type ("Challenger" Exped.); North and South Islands, from between tide-marks to 110 fathoms; Kermadec Islands (Captain Bollons).

Remarks.—The angle of the spire of the type, measured on the figure, is 18°, but this varies to nearly 20°. Watson says that the species resembles *T. knysnaensis*, Krauss, but I cannot agree with him. *T. Hanleyana*, Reeve, seems to be a very nearly allied form, but certainly not the young of *T. rosea*, Q. & G., as suggested by Tryon. The sinus of the outer lip is not quite so deep as in *T. rosea*.

Fossil in the Miocene and Pliocene.

2. Turritella chordata, Suter, 1908. Plate 15, fig. 10.

Turritella chordata, Suter, P. Mal. S., viii, 39, pl. 3, f. 51.

Shell small, subulate, moderately solid, spirally lirate, white. *Sculpture:* The first 1½ whorls are smooth, the next has 3, the following 4, the fourth 5, and all the succeeding whorls 6 subequidistant prominent flatly rounded spiral cords, the suprasutural cord being less

distinct; on the last whorl each of the furrows between the cords is provided with a fine thread, and the carina bounding the base bears the suprasutural cord; base with 6 fine cinguli. *Colour* dirty-white. *Spire* high, narrowly conical; outlines lightly convex. *Protoconch* globose, smooth and polished. *Whorls* 8, regularly increasing, convex; base nearly flat. *Suture* impressed. *Aperture* vertical, oval, higher than broad. *Outer lip* sharp, with a broadly rounded not very deep sinus. *Basal lip* effuse. *Columella* vertical, almost straight. *Inner lip* slightly reflexed, spreading over the parietal wall as a thin white and shining callus. *Operculum* unknown.

Diameter, 3·7 mm.; height, 10·8 mm. (shell of 8 whorls).

Animal unknown.

Type in my collection.

Hab.—Dredged off Otago Heads (A. Hamilton).

Remarks.—The only specimen I possess has the outer lip damaged. The shell is, no doubt, not quite full grown. There is a very nearly allied form, still undescribed, from the Pliocene of Waikopiri, in my collection.

3. Turritella difficilis, Suter, 1908. Plate 15, fig. 11.

Turritella difficilis, Suter, P. Mal. S., viii, 40; pl. 3, f. 52.

Shell small, elevated conical, rather thin, lower whorls with 3 cinguli, the lowest suprasutural. *Sculpture:* The first two whorls smooth, the third with a spiral at the periphery and one below it, the next four whorls with 4 spirals, interspaces subequal, the lowest spiral close to the suture; on the remaining whorls the second, median, spiral is becoming much finer, and at the same time another fine spiral thread appears; very soon they increase to the number of 6 to 8, filling the interspace between the original first and third prominent spiral; a few spiral threads develop between the suture and the first spiral, and 4 to 5 between the suprasutural and the spiral above; the suprasutural spiral forms a sharp keel bounding the base, which is finely spirally striated; growth-lines indistinct, sinuate. *Colour* yellowish-white. *Spire* high, conical, with straight outlines. *Protoconch* of 2 smooth strongly convex whorls. The number of *whorls* may be 15 or more; the third and fourth gradate, the following two or three convex, and the rest flat, the interspaces between the spirals concave; base excavated. *Suture* impressed. *Aperture* subquadrate. *Outer lip* sharp, with a moderately deep median rounded sinus. *Columella* vertical, arcuate.

Diameter, 6 mm.; height, 16 mm. (immature specimen of 10 whorls only). Angle of spire, 20°.

Animal unknown.

Type in my collection.

Hab.—Near the Snares, in 50 fathoms (Captain Bollons). No perfect specimens.

Remarks.—Miss J. Donald mentions (P. Mal. S., iv, 50) that in the British Museum, Cuming collection, there are of *T. sinuata*, Reeve, six specimens from Stewart Island, and two from New Zealand. I have seen a good many specimens of *Turritella* from all parts of New Zealand, but I never came across the Australian *T. sinuata*, nor the Tasmanian *T. quadrata*, Donald, either Recent or fossil. If the specimens in the British Museum mentioned by Miss Donald are really *T. sinuata*, then the locality stated is most likely wrong.

4. Turritella fulminata, Hutton, 1873. Plate 39, fig. 18.

Turritella fulminata, Hutt., C.M.M., 29; J. de Conch., xxvi, 29; M.N.Z.M., 84; P.L.S. N.S.W., ix, 939; Index, 76; Murdoch and Suter, T.N.Z.I., xxxviii, 292.

Shell turreted, narrow and high, with 2 prominent spirals and undulating longitudinal brown markings. *Sculpture:* The first two whorls smooth, the third and fourth with 2 spirals; on the succeeding whorls fine threads are intercalated, varying in number, but the two original spirals always remaining more prominent: these spirals divide the whorl into 3 subequal sections: body-whorl keeled; base with numerous spiral lines: growth-lines very fine, close, sinuate on the middle of the whorls, more distinct and oblique upon the base. *Colour* cinereous, with longitudinal undulating markings of reddish-brown. *Spire* high, narrowly conic; outlines straight. *Protoconch* consisting of 2 convex, white, smooth whorls. The *whorls* in large specimens number up to 20, but the specimens usually found have about 15; they are sloping from the suture to the first main spiral; the following two sections are slightly concave; base flat. *Suture* distinct, but not much impressed. *Aperture* subquadrangular, rounded above, flat at the base, and angled; slightly effuse. *Outer lip* sharp, with a moderately deep inframedian rounded sinus. *Columella* vertical, a little arcuate, sharp. *Inner lip* spreading a little beyond the columella above, and forming a very thin shining callous layer on the parietal wall.

Diameter, 7 mm.; height, 24 mm. (specimen of 14 whorls). Diameter, 7·5 mm.; height, 31 mm. (type). Angle of spire, 15–18°.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Great Barrier Island (type); Auckland Harbour, on rocks near low-water mark; near Channel Island, Hauraki Gulf, in 25 fathoms; off Great Barrier Island, in 110 fathoms; Bay of Islands.

Remarks.—Von Martens thought this species to be near *T. tasmanica*, Reeve, but I am informed by Mr. Hedley that this is known only from a single worn shell in the British Museum. Tate and May exclude it from their catalogue. Possibly it is exotic.

Fossil in the Pliocene.

5. Turritella pagoda, Reeve, 1849. Plate 39, fig. 17.

Turritella pagoda, Reeve, Conch. Icon., v, f. 60; Man. Conch. (1), ix, 204, pl. 64, f. 95; Murdoch and Suter, T.N.Z.I., xxxviii, 292.

Shell not very large, elevated, and many-whorled, with 1 prominent keel, thin and fragile. *Sculpture:* The first two whorls are smooth; the next two have a sharp keel on the middle; on the succeeding whorls this keel is gradually getting lower down, till it is situate at the lower third of the whorl, but it always remains the most conspicuous of the cinguli; from the fifth whorl down a number of fine spiral threads appear above and below the principal keel, and one of them, situate at the upper third of the whorl, is getting somewhat stronger than the others; the fine threads are unequal in strength, usually the finer and thicker threads are alternating; base with very fine unequal spiral lines. *Colour* whitish, obscurely flamed with light fulvous. *Spire* high, narrowly conic; outlines straight. *Protoconch* of 2 smooth, convex, and slightly angled whorls. *Whorls* 14 to 15, regularly increasing, slantingly flattened, but sometimes slightly concave above and below the keel; body-whorl sharply angled; base flattish. *Suture* impressed. *Aperture* subquadrangular, vertical. *Outer lip* sharp and thin, with a rather deeply rounded sinus a little below the middle; outer and basal lip slightly produced upon the keel bounding the base. *Columella* vertical, but little callous. *Inner lip* slightly spreading beyond the columella above, and as a thin and polished glaze over the parietal whorl. *Operculum* unknown.

Diameter, 6·5 mm.; length, 22 mm. (specimen of 10 whorls). Angle of spire, 18°.

Animal unknown.

Type in the British Museum.

Hab.—Great Barrier Island; off Great Barrier Island, in 110 fathoms; off Cuvier Island, in 37 fathoms (Captain Bollons); near Channel Island, Hauraki Gulf, in 25 fathoms.

Fossil.—Miocene and Pliocene.

6. Turritella rosea, Quoy and Gaimard, 1834. Plate 39, fig. 16.

Turritella rosea, Q. & G., Voy. Astrol., iii, 136, pl. 55, f. 24–26; Dieff. N.Z., 242; Conch. Icon., v, pl. 8, f. 41; Man. Conch. (1), ix, 199, pl. 62, f. 67, 68; C. Tert. M.B.M., 240; Kiener, Icon. Coq. Viv., 1843, 32, pl. 12, f. 2. *T. lineolata*, Kiener, *t.c.*, 25, pl. 5, f. 2.

Shell rather large, more or less irregularly spirally striated, body-whorl carinated, thin. *Sculpture:* The nucleus is smooth, the second whorl has a median keel and below it a faint spiral thread, the third to fifth whorl with 3 spiral threads, and on the succeeding whorls numerous close and much finer spiral lines are intercalated; the upper and lower cinguli remain mostly more prominent on all the

whorls, but the median thread of the upper whorls usually diminishes in strength, and some of the intercalated cinguli are getting a little stronger; sometimes, however, all the spiral lines are of nearly the same strength on the last few whorls; the acute keel of the body-whorl is spirally striated; base with about 15 flat spiral ribs, each with 1 or 2 fine grooves; the fine and deeply sinuated growth-lines are much more distinct on the lower whorls. *Colour* yellowish or reddish-brown, faintly marbled with dark brown, the raised cinguli usually of darker brown. *Spire* high, conic; outlines straight. *Protoconch* minute, of 1 smooth globose whorl; the first few whorls are mostly broken off. *Whorls* about 16, first slowly then more rapidly increasing, flat or but slightly convex; base flat. *Suture* deep, but sometimes it is not much impressed. *Aperture* subquadrate, interior polished, yellowish, with numerous brown spiral bands. *Outer lip* thin, sharp, with a deep and broadly rounded sinus in the middle, drawn out together with the basal lip towards the keel of the body-whorl, and forming a sharp point. *Columella* vertical, thin and sharp below. *Inner lip* reflexed over the columella above, and forming a thin polished glaze on the parietal wall. *Operculum* thin, horny, circular, multispiral.

Diameter, 18 mm.; height, 60 mm. (type): angle of spire, 20–22°. Diameter, 20 mm.; height, 69 mm. (specimen of 16 whorls).

Animal with a proboscidiform muzzle, brown, spotted with black. Tentacles moderately long, obtuse, white, with the sessile eyes near their base. Foot quadrilateral, slightly broader in front, greenish or yellowish, spotted with brown. Mantle fringed, with regularly disposed whitish lunules. (Q. & G.)

Dentition.—Hutton, T.N.Z.I., xv, 122, pl. 14, f. C.

Type in the Mus. Hist. Nat., Paris.

Hab.—Astrolabe Roads, Tasman Bay, in a depth of several fathoms, type (Q. & G.); North and South Islands; Chatham Islands.

In my collection the species is represented from the following localities: Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons); Preservation Inlet; Timaru; Lyttelton Harbour, in 4 fathoms (H. S.); Tasman Bay, in 16 fathoms (Captain Bollons); near Wanganui; Narrow Neck Reef, Hauraki Gulf (H. S.); near Channel Island, Hauraki Gulf, in 25 fathoms; Bay of Islands.

Remarks.—Although the sculpture varies a good deal, the greater number of specimens that came under my notice have on the lower whorls 2 more conspicuous cinguli than the others, 1 above and 1 below; between them there are 2 less-prominent threads, and 1 below the suture; the interspaces with unequal fine spiral threads. It is only by dredging that perfect specimens can be obtained.

Maori.—Takavi (*fide* Quoy and Gaimard); kukukuroaroa (*fid* Captain Bollons).

Fossil in the Miocene and Pliocene.

7. Turritella symmetrica, Hutton, 1873. Plate 39, fig. 20.

Turritella (*Eglisia*) *symetrica*, Hutt., C.M.M., 30. *T. rosea*, Mantell, Quart. Journ. Geol. Soc., vi, 1850, 331, pl. 28, f. 16; not of Quoy and Gaimard *T.* (*Zaria*) *tricincta*, Hutton, C. Tert. M., 13; not of Borson and auth. *Eglisia symmetrica*, Hutt., J. de Conch., 1878, 29; M.N.Z.M., 8c. *T. kanieriensis*, Harris, C. Tert. M.B.M., 241; Index, 76.

Shell rather small, elongated, narrow, with prominent spiral ornamentation, thin and translucent. *Sculpture:* The first $1\frac{1}{2}$ whorls smooth, the following ones with 3 subequal and equidistant spiral keels, with a few fine spiral threads in the interspaces; base with unequal, fine, flat, spiral lines. *Colour* light-yellowish. *Spire* high, narrowly conical; outlines straight. *Protoconch* of $1\frac{1}{2}$ smooth, convex, white and shining whorls. *Whorls* about 14, regularly increasing, convex; base flattened. *Suture* impressed. *Aperture* vertical, subquadrangular. *Outer lip* thin, sharp, with a deep, broadly rounded, median sinus, produced upon the keel of the body-whorl. *Columella* vertical, rounded, narrowed below, and connecting with the slightly effuse basal lip. *Inner lip* spreading as a thin polished glaze across the body-whorl. *Operculum* unknown.

Diameter, 5·5 mm.; height, 17 mm. (type). Diameter, 6·5 mm.; height, 23·5 mm. (specimen of 14 whorls). Angle of spire, 18°.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Stewart Island (type); Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons); Dunedin Harbour (A. Hamilton); Lyttelton Harbour, in 2 to 4 fathoms (H. S.).

Fossil.—Miocene and Pliocene.

Fam. MATHILDIIDÆ, Dall.

In form these shells recall *Bittium* and *Turritella;* they are small, turriculated, and slender; the whorls spirally ridged and radially striated; the blunt sinistral nucleus not or only partly immersed. Aperture entire, peristome sharp, columella smooth. Operculum horny, multispiral.

Genus 1. MATHILDA, Semper, 1865.

Mathilda, Semper, J. de Conch., xiii, 1865, 328. Type: *M. quadricarinata*, Brocchi.

Animal with very long thread-like, divergent tentacles, with rather large eyes on prominences upon their exterior side, about a quarter of their length from the base; foot large, cut out in front, obtuse behind; operculigerous lobe having a row of cilia in constant movement. Radula unknown.

Shell turriculated, rather solid, apex heterostrophe, abruptly turned from left to right; whorls in the typical species cingulated and reticulated by radiate striæ. Aperture entire, subrotund, base sometimes subeffuse; lip acute; columella smooth. Operculum

corneous, rather solid, multispiral, the external face concave, nucleus central.

Dr. W. H. Dall classes *Mathilda* as a synonym of *Tuba*, Lea, 1833, or at least as a section of it: Trans. Wagner Free Inst., iii. pt. 2, 1892, 318. For the present, however, I prefer to consider *Mathilda* as a distinct genus.

Distribution. — Seas of Europe, China, Australasia, Strait of Magellan. There are a number of Tertiary and a few Secondary species.

Remarks.—Dr. P. Fischer writes, "*Mathilda* has the shell of *Turritella*, with the sinistral embryonic whorls of *Pyramidella*. The exterior form of the animal, the position of the eyes, and the structure of the operculum relate it to the former."

1. Mathilda neozelanica, Suter, 1908. Plate 15, fig. 12.

Mathilda neozelanica, Suter, P. Mal. S., viii, 40, pl. 3, f. 53.

Shell minute, turriculate, spirally ridged and radially finely striate, imperforate. *Sculpture:* The first, embryonic, whorl with 4 sharp spirals; the second with a median spiral and 1 below it; the third with an additional fine spiral thread upon the shoulder, increasing to 2 on the following whorls; the last whorl with a double keel bounding the base, which is finely spirally striate; the spiral sculpture reticulated by radiate, subequidistant, straight threads, which do not extend upon the base; interstices microscopically reticulated. *Colour* white. *Spire* elevated conic, much higher than the aperture, apex blunt; outlines straight. *Protoconch* with the smooth nucleus almost completely immersed in the spire. *Whorls* $5\frac{1}{2}$, regularly increasing, the upper whorls distinctly shouldered, the last more convex; base flat. *Suture* impressed. *Aperture* rotund, vertical, effuse at the base towards the columella. *Outer lip* simple, dentate by the sculpture. *Columella* vertical, slightly arcuate, rounded, very little expanded. *Operculum* unknown.

Diameter, 1·2 mm.; height, 2·5 mm.

Animal unknown.

Type in my collection.

Hab.—Narrow Neck Reef, Hauraki Gulf; one specimen in sand (H. S.).

Remark.—The Australian *M. decorata*, Hedley (Mem. A.M., iv. pt. 6, 352, f. 75 in text), is an allied species, though larger and having a different protoconch.

Fam. **STRUTHIOLARIIDÆ**, Fischer.

Animal having rather short slender tentacles, with the eyes on short pedicels at their external bases; foot oval, adapted for swimming; proboscis long; siphon scarcely perceptible. Dentition 2+1+1+1+2, but in some species the marginals increase to 5; the central tooth

is subquadrangular, with multicuspidate edge; the laterals oblong, multicuspid, and the marginals falciform, sharp, narrow, with crenulated margins.

Shell bucciniform, generally ornamented, the aperture angular, shortly subcanaliculated below, sinuate on the right side; lip thickened, sinuous, not winged; columella thick, polished, subtruncate below; inner lip broadly expanded. Operculum short, unguiculate, nucleus apical.

Genus 1. Struthiolaria, Lamarck, 1816.

Struthiolaria, Lam., Encycl. Méth., Vers. Coq., Moll., &c., iii, 1816, pl. 431, f. 1 *a*, *b*. Type: *S. nodulosa*, Lam. (= *papulosa*, Martyn). *Pelicaria*, Gray, 1857.

Animal with the outer mantle-margin simple, tentacles cylindrical; eye-pedicels short, adnate with the tentacles externally; foot broad and short.

Shell oval-oblong, imperforate; spire turreted; aperture truncated in front; lip entire, thickened, sinuous, prominent in the middle; inner lip callous, expanded. Operculum short, claw-shaped, with a sharp apical projection.

Distribution.—Australia, New Zealand, Magellan, Kerguelen, and Seychelles.

Fossil.—Tertiary.

The genus is represented in the Eogene of Patagonia and Chile, but not in the Neogene of meridional America. Representatives of the family (*Struthiolariopsis*, Wilkens) occur in the Upper Cretaceous of Chile and Patagonia, thus proving the South American origin of the family. The Miocene species of *Struthiolaria* of New Zealand are of more recent origin than those of South America. (Von Ihering.)

Key to Species.

A.	Shell moderately large, spire-whorls with 1 carina	*papulosa*.
B.	Shell smaller, spire-whorls bi- or tri-carinate.	
	a. Suture deeply excavated	*vermis*.
	aa. Suture not or but very little excavated	*tricarinata*.

1. Struthiolaria papulosa, Martyn, 1784. Plate 40, fig. 1.

Buccinum papulosum, Mart., Un. Conch., ii, 1784, f. 54. *Struthiolaria papulosa*, Mart., Conch. Icon., vi, pl. 1, f. 3; Ad. G.R.M., pl. 27, f. 6*b*; Chenu, Man. Conch., 263, f. 1649; Man. Conch. (1), vii, 133, pl. 12, f. 34. *Murex stramineus*, Gmelin, Syst. Nat., ed. xiii, i, 1790, 3542. *Struthiolaria nodulosa*, Lamarck, A.s.V., vii, 1822, 147. Fischer, Man. Conch., pl. 4, f. 6. *S. sulcata*, Jonas, Arch. f. Nat., i, 1839, 342, pl. 9, f. 5; Man. Conch. (1), vii, 134, pl. 12, f. 38. *S. gigas*, Sowerby, Thes. Conch., i, 1842, pl. 5, f. 17; Man. Conch. (1), vii, 133, pl. 12, f. 37. *S. papillosa*, Martyn: Gray, in Dieff. N.Z., 231.

Shell moderately large, ovately acute, imperforate, turreted, solid, with a strongly callous peristome. *Sculpture* very variable; the spiral threads are sometimes very close and regularly spaced, more often at irregular intervals, and occasionally far apart in bands of 2 and 3; the prominent angle at the shoulder may be faintly, distantly tuberculose, or the tubercles may attain to a great size; the growth-lines

are fine and flexuous. *Colour* cinereous, with close longitudinal waved stripes of purple; interior of mouth light brown; peristome yellow or white, the outer margin chestnut-brown. *Epidermis* very thin, horny, deciduous. *Spire* high, conic, turreted, somewhat higher than the aperture; outlines slightly convex. *Protoconch* of $2\frac{1}{2}$ convex, finely spirally striated whorls. *Whorls* 8 to 9, regularly increasing, shoulder broad, flat or lightly convex, straight and subvertical below; last whorl with a second angle bounding the base, which is flatly convex. *Aperture* oval, channelled above, produced into a short canal below. *Peristome* continuous. *Outer lip* thick, polished, sinuous, a light sinus at the middle and a deeper one on the base; distinctly angled above on the continuation of the upper carina, and with a rounded projection below the lower angle of the whorl. *Columella* arcuate, rounded, subtruncate below, sometimes ending in a blunt point. *Inner lip* thick and polished, spreading far beyond the columella as a thinner callus over the concave parietal wall, but forming a thick tubercle at the upper end and forming a distinct channel with the outer lip. *Operculum* oval, with a very sharp projection, dark brown, and concentrically striated.

Diameter, 50 mm.; height, 83 mm. Angle of spire, 55–60°.

Animal (Hutton, T.N.Z.I., xv, 117, pl. 12).—The œsophagus is long, the intestine passing through a loop of the aorta, anus on the right side. Gill single, attached to the mantle on the left side; the plates long, stiff, free, and simple. Renal organ at the base of the gill, the duct opening at the base of the intromittant organ in the male, and between the right tentacle and the anus in the female. The intromittant organ is long, slender, non-retractile, situate at the base of the right tentacle. The oviduct of the female ends behind the right tentacle in an expanded fold of the skin.

Dentition.—The odontophore is small. (Hutton, T.N.Z.I., xiv, 163, pl. 6, f. H; xv, pl. 12, f. 4.)

Type lost.

Hab.—North and South Islands, Stewart Island; more common in the north: Cheltenham Beach, Auckland, in sand at extreme low water (H. S.); Wellington Harbour (H. S.); Nelson (Envs); New Brighton, washed up after gales (H. S.); Port Pegasus, Stewart Island, in 18 fathoms, alive (Captain Bollons); Bay of Islands (Q. & G.); Kermadec Islands. Brought to England by Captain Cook. Also recorded from the Seychelles.

Remarks.—The operculum, with its free and sharply pointed end, no doubt serves as a weapon of defence. On taking up a specimen the foot is extended to about 2 in. in length, and moved about in all directions. The Maoris are very fond of the animal of this species, and so are many white people. The peristome of the shell, after removal of the other parts, strung on flax-fibre, was used as an ornament by the Maoris.

Maori.—Takai (*fide* Quoy and Gaimard).

Fossil in the Pliocene.

2. Struthiolaria vermis, Martyn, 1784. Plate 40, fig. 2.

Buccinum vermis, Mart., Un. Conch., ii, 1784, f. 53. *Struthiolaria vermis*, Mart., Conch. icon., vi. f. 4; Ad. G.R.M., pl. 27, f. 6: Chenu, Man. Conch., i, 263, f. 1653; Man. Conch. (1), vii, 133, pl. 12, f. 35, 36. *S. australis*, Gmel., Syst. Nat., ed. xiii, i, 1790, 3542. *S. crenulata*, Lamarck, A.s.V., vii, 1822, 148; Voy. Astrol., ii, 430, pl. 31, f. 7–9. *S. inermis*, Sowerby, Thes. Conch., i, 1842, 23, pl. 5, f. 12, 13, 19.

Shell not very large, ovato-acute, not very thick, turreted, imperforate. *Sculpture:* The whorls are bicarinate; the upper carina, limiting the shoulder, is more prominent, and ornamented with more or less distinct small nodules; the lower keel is rounded, but faintly nodulous, and low and smooth on the last whorl; the interspaces with unequidistant and subequal spiral lines, more distant and stronger upon the base; the growth-lines are numerous, flexuous, and distinct. *Colour* cinereous or reddish-brown, with undulating streaks of darker; interior of mouth mostly white, sometimes pale violet; peristome yellow, margined with brown. *Spire* conical, turreted, very little higher than the aperture. *Protoconch* of 2 convex whorls, finely spirally striated, convex, the nucleus large and flat. *Whorls* 6 to 7, regularly increasing, shoulder oblique, flat, interspace between the upper and lower keel and between the latter and the suture concave; base flattened and somewhat depressed. *Suture* deeply excavated. *Aperture* oval, higher than broad, with a rather wide channel above, and a very short canal at the base. *Outer lip* thick and rounded, with a shallow sinus on the middle and one at the base, where it is slightly effuse. *Columella* oblique, arcuate, subtruncate below. *Inner lip* very thick, broadly expanded on the base, spreading over the concave parietal wall, and forming a prominent callus near the outer lip. *Operculum* small, unguiculate.

Diameter, 29 mm.; height, 45 mm. Angle of spire, 55–60°.

Animal.—Voy. Astrol., pl. 31, f. 8, 9; T.N.Z.I., xv, pl. 12, f. 6.

Type lost.

Hab.—North Island; very rare south of Cook Strait: Auckland Harbour (H. S.); Manawatu; Tasman Bay (Q. & G.); Queen Charlotte Sound, in 16 fathoms (Captain Bollons). Brought to England by Captain Cook.

Fossil.—Miocene and Pliocene.

Subsp. tricarinata, Lesson, 1830.

Struthiolaria tricarinata, Lesson, Ann. Sci. Nat. (2), xvi, 256. *Struthiolaria vermis*, subsp. *tricarinata*, Lesson, M.N.Z.M., 68. *S. scutulata*, Martyn: Gray, in Dieff. N.Z., 232; not of Martyn; C.M.M., 24, wrongly as of Deshayes.

Shell resembling very much *S. vermis*, but usually there appears a third keel above the suture on the penultimate whorl, the body-whorl having 3 keels, the uppermost distinct, the two lower ones

much less prominent. Young specimens of 4 whorls show 3 very distinct rounded keels on the last whorl, the lowest arising from the suture. The protoconch is the same as in the species. Suture not excavated, well impressed, the whorl forming a narrow flat or very lightly concave band below it. Size the same as the species.

Animal unknown.

Type in the Mus. Hist. Nat., Paris.

Hab.—Auckland Harbour (H. S.); near Channel Island, Hauraki Gulf, in 25 fathoms; South Island (*teste* Hutton); Little Barrier Island, in 20 fathoms (R. H. Shakespear); Bay of Islands (J. C. Anderson).

Fossil in the Pliocene of Wanganui.

Fossil adult specimens show the 3 keels on the last whorl much more distinctly than I have seen it on Recent forms.

Fam. **XENOPHORIDÆ**, Philippi.

Onustidæ, H. and A. Adams.

Animal with long, annulated muzzle; elongated, subulate tentacles, with sessile eyes at their external base; foot small, used for jumping, not walking, with the anterior portion expanded, posteriorly tapering; gill long, composed of narrow laminæ and filaments. Dentition 2 + 1 + 1 + 1 + 2; the central tooth subtrigonal, multicuspid; laterals large, subtriangular, the margin reflected and multicuspid; the marginals very narrow and long, arcuated.

Shell depressed or conical, trochiform, with carinated periphery, not nacreous; very often soldering shells, stones, &c., to its upper surface. Operculum large, horny, subannular, with lateral dextral nucleus, muscular impression sinistral, semilunar, extending the whole length.

These molluscs scramble along like the Strombs; they extend and fix the front dilated part of the foot, and draw the posterior portion up to it, jerking the shell forwards at every movement; this mode of progression is adapted to the nature of the surface on which they move, which is usually composed of the *débris* of dead shells. The peculiarity of this family is the habit of agglutinating foreign bodies to the upper surface of the shell, which is carried to such an extent in some instances as to conceal the volutions and give the structure the appearance of a small pile of fragments of stones and shells. This imitation of its surroundings is no doubt protective in its nature. Of the shells attached, single valves of Lamellibranchs are preferred; the interior of these is always turned up and free.

The species *Xenophora conchyliophora* dates back to the Eocene of North America, and is still living in the West Indies, which is a strong testimony to the protective value of the device by which the members of this family defend themselves. (Dall.)

Genus 1. Xenophora, G. Fischer, 1807.

Xenophora, G. Fischer, "Museum Demidoff," iii, 1807, 213. Type: *X. laevigata*, G. Fischer (*Trochus conchyliophorus*, Born). *Phorus*, Montfort, 1810. *Pseudophorus*, Meck. *Astraea*, Bolten, 1798 (in part).

Shell conical, trochiform, concave or flattened below; whorls broad, commonly carrying pieces of stone, shells, or other objects, which are agglutinated to or imbedded in the upper surface of the shell, sometimes completely hiding it from view; last whorl compressed, keeled at the periphery; aperture large, oblique, outer margin very oblique and sharp; umbilicate, narrowly rimate, or imperforate. Operculum suboval or trapezoidal.

Devonian to Recent.

About twenty species are known, and they occur in the Indian and Pacific Oceans, China, Japan, Antilles, Africa, Mediterranean.

Vernacular Name.—Carrier-shell.

1. Xenophora corrugata, Reeve, 1842. Plate 15, fig. 13.

Phorus corrugatus, Reeve, P.Z.S., 1842, 163; Conch. Syst., ii, pl. 214, f. 5; Conch. Icon., i, pl. 2, f. 6. *Xenophora corrugata*, Reeve, Man. Conch. (1), viii, 159, pl. 45, f. 81, 82; Fischer, Coq. Viv., Trochus, pl. viii. *Phorus onustus*, Reeve: Hutton, C.M.M., 31; not of Reeve. *P. conchyliophorus*, Born: von Martens, Errata and Addenda to C.M.M., 1874, 2; Hutton, J. de Conch., xxvi, 30. *Xenophora conchyliophora*, Born: Hutton, P.L.S. N.S.W., ix, 943; not of Born. *X. pallidula*, Reeve, Index, 79; not of Reeve. *X. neozelanica*, Suter, T.N.Z.I., xl, 1907 (1908), 346, pl. 26, f. 1, 2.

Shell large, trochiform, imperforate when adult (young shells being narrowly umbilicated), upper surface almost entirely concealed by agglutinated shells. *Sculpture:* Strong, oblique, irregular growth-lines are crossed by oblique, flexuous, and sometimes strongly curved striæ, directed forward, usually more prominent near the periphery, which in places is produced into long, hollow, and deeply grooved spines, situated between the attached shells; base with numerous inequidistant and sharp-ridged curved and granose ribs, the interstices with fine threads of growth or almost smooth; crossed by rather distant spiral ribs, very distinct in young shells, but obsolete or wanting in adult specimens. *Colour* white or light-yellowish, the ridges upon the base yellowish to reddish-brown. *Spire* conical; outlines mostly slightly convex. *Protoconch* small, conic, of a few convex smooth whorls, polished and white, with marks of agglutination of very small foreign bodies. *Whorls* about 9–10, first slowly then more rapidly increasing, the last whorl carinated; base flat, concave towards the periphery. *Aperture* low and broad, inside porcellanous, highly polished. *Outer lip* very much produced along the periphery, the upper and outer wall forming a roof, the inside of which is porcellanous. *Columella* short, subvertical, arcuate, continued below into the horizontal, arcuate, sharp, and deflexed basal lip. *Inner lip* reflexed over the umbilical tract, forming a thick white and shining callus, and extending in a thin layer over the parietal wall. *Operculum* subquadrangular, with a long and narrow muscular impression.

Dimensions of shells from near Cuvier Island, without the agglutinated shells:—Diameter, 68 mm.; height, 35 mm.: diameter, 70 mm.; height, 58 mm.

Dentition (Suter, T.N.Z.I., xl, 346, fig. in text).—Central tooth oval, with a strong median and 4 small cusps on each side; lateral teeth sharply pointed on the inner upper side.

Type in the British Museum.

Hab.—Hauraki Gulf, in deep water; near Tiri Tiri Island, in about 20 fathoms; ten miles west of Cuvier Island, in 32 fathoms (Captain Bollons); near Little Barrier Island, in rather shallow water (Mr. Shakespear, jun.); off the Bay of Islands, in about 50 fathoms. Indian Ocean, Japan.

Remarks.—Two specimens, habitat unknown, are in the Dominion Museum. The New Zealand shell is neither *X. conchyliophora*, as suggested by von Martens, nor *X. pallidula*, as it was named by the late Captain Hutton; it also is not a new species, as assumed by myself. Captain Bollons presented a specimen to the Australian Museum, Sydney, and on the 13th July, 1909, Mr. C. Hedley wrote to me, "Judging by Fischer (Coq. Vivantes, Trochus, pl. viii), the shell Captain Bollons sent me seems to be *Xenophora corrugata*, Reeve." This is undoubtedly correct. Captain Bollons had meanwhile kindly given me a young specimen of our *Xenophora*, and this shows the spiral ribs upon the base remarkably well. The absence of this sculpture in the two adult shells I have induced me to consider them to be a new species. The shells attached are usually *Chione mesodesma* and *C. Stutchburyi*.

Fossil in the Miocene and Pliocene.

Fam. CAPULIDÆ, Fleming.

Animal with a distinct head and lengthened muzzle; eyes near the external base of the tentacles; only one branchial plume is developed; a tongue-shaped projection between snout and foot.

Shell limpet-like, with a more or less spiral apex; interior simple, with a horseshoe-shaped muscular impression.

They are inhabitants of most seas, and date back to the Silurian.

Key to Genera.

A. Shell conical, with an inclined recurved apex .. .. .. Capulus.
B. Shell flattish, with a not recurved apex .. .. .. Neojanacus.

Genus 1. Capulus, Montfort, 1810.

Capulus (pars), Montfort, Conch. Syst., ii, 1810, 55. Type: *Patella ungarica*, L. *Galerita*, Brongniard, 1808; not of Fabricius, 1801. *Amalthea* β, Schumacher, 1817; not *Amaltheus*, Montfort, 1810. *Cabochon*, Lamarck, 1812. *Pileopsis* (pars), Lamarck, 1822. *Actita*, Fischer de Waldheim, 1825.

Animal with lengthened rostrum; tentacles subulate, with the eyes at their outer bases; mantle-margin fringed; foot suborbicular,

simple; gill-plume placed obliquely across the mantle-cavity, the elongate linear laminæ partly exposed. Central tooth of the radula trapezoidal, the reflected margin triangular, having long sharp median and very fine lateral cusps; laterals multicuspidate; marginals simple.

Shell conical, provided with epidermis, apex posterior and directed to the right, more or less spirally curved; aperture basal, the lip continuous, no inner process, the horseshoe-shaped muscular impression on the inner wall.

The few species inhabit the seas of Europe, the East and West Indies, western America, Australasia, &c.

Fossil.—The genus commenced with the Silurian.

1. **Capulus calcareus**, Suter, 1909. Plate 15, fig. 14.

Capulus calcareus, Suter, "Records Canterbury Museum," i, No. 2, 1909, 122, pl. 12, f. 1, 2.

Shell small, fairly solid, somewhat irregularly ovate, very little asymmetrical. *Sculpture* consisting of fine radiate striæ, crossed by distinct concentric growth-lines; most specimens I have seen had partly lost the epidermis and the radiate sculpture, the surface being quite smooth and chalky. *Colour* yellowish-brown; white after having lost the epidermis, which is thin, horny, and peeling off very easily. *Apex* projecting far past the base. *Protoconch* well defined, of $1\frac{1}{4}$ smooth and convex whorls. *Whorls* $1\frac{3}{4}$, the last half large, convex, expanded towards the aperture; posterior slope below the apex short, concave. *Aperture* oval to subcircular, expanded, margin uneven, sharp; inside white, polished.

Breadth, 8·5 mm.; length, 11·5 mm.; height, 5 mm.

Dentition.—Formula of radula 2 + 1 + 1 + 1 + 2. Central tooth trapezoidal, with a large median and 4 smaller cusps on each side. Lateral teeth with a large triangular reflection bearing 5 denticles on the inner side. Marginals uniform, the inner teeth with sharply pointed denticles on the posterior edge, outer marginals smooth.

Type in the Canterbury Museum, Christchurch.

Hab.—Nine miles west of Cape Runaway, Bay of Plenty, in 105 fathoms, on dead shells of *Megalatractus maximus*, Tryon (type); six miles east of Jones Head; off Lyttelton, in 100 fathoms (E. R. Waite).

Genus 2. NEOJANACUS, Suter, 1907.

Neojanacus, Suter, T.N.Z.I., xxxix, 1906 (1907), 266. Type: *N. perplexus*, Suter.

Animal unknown.

Shell having the appearance of the flat form of *Crepidula contorta*, Q. & G., without a basal plate; small, flattened, oval or oblong scutiform, with a minute subspiral apex and a horseshoe-shaped muscular impression.

Known from New Zealand only.

1. Neojanacus perplexus, Suter, 1907. Plate 15, figs. 15, 15*a*.

Neojanacus perplexus, Suter, T.N.Z.I., xxxix, 266. Genus (?), Murdoch and Suter, T.N.Z.I., xxxviii, 1905 (1906), 301, pl. 27, f. 52–54.

Shell small, flat, convex when young, of very variable shape, mostly elongately oval, the posterior end with a broad inward curve. *Sculpture* consisting of numerous small rounded and irregularly spaced concentric growth-periods, more distant anteriorly. *Colour* whitish. *Epidermis* very thin, horny, easily rubbed off. *Protoconch* terminal, distinctly marked off, smooth and polished, cap-shaped, with a slightly flattened rim-like margin; it consists of one turn, somewhat oblique to the major axis. The *margins* slightly laminated, and usually with an upward curve, thus giving the dorsal surface a slightly concave aspect. *Lower surface* porcellanous, highly polished, with a horseshoe-shaped muscular impression, open in front, and extending over nearly half the length of the shell.

Breadth, 4·66 mm.; length, 7·76 mm. (type).

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms (type); Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons); Bounty Islands, in 50 fathoms (Captain Bollons).

Remark.—This shell, no doubt, lives in the aperture of other shells, like *Crepidula contorta*, Q. & G.

Fam. **HIPPONICIDÆ**, Fischer.

Amaltheidæ, Dall.

Animal without a foot, properly so called; adductor muscle fixed to the interior of the shell above, and below either to the substratum excavated in the surface of the body on which the mollusc is attached or to a ventral calcareous opercular-like piece which completely closes the aperture; inferior surface of the body encircled by a sort of ventral mantle with papillary margins, resembling the dorsal mantle, and morphologically corresponding to the epipodium; muzzle long, deeply incised, and terminated by 2 lateral lobes; tentacles long, subulate, the eyes sessile towards their base; a spatuliform growth below the neck. Radula $2 + 1 + 1 + 1 + 2$, the central tooth subquadrangular, the margin pectinated, the central cusp longer; lateral teeth with denticulate margins; marginals narrow, curved, denticulate.

Shell conical, peristome simple, with or without an internal process attached at the apex, but an opercular piece normally forms the base to the shell, and is soldered to the surface of the body on which it lives attached.

The *Hipponicidæ* are such strange molluscs that they have been classed with the Rudistes by Sowerby and with the Brachiopods by Morris. They appear to be formed by two valves, one dorsal, the other ventral, but in reality the ventral valve is a curiously modified operculum, secreted by the epipodium. The embryos have a spiral shell.

Genus Hipponix, Defrance, 1819.

Hipponix, Defrance, Bull. Soc. Philom., Paris, Jan. 1819, 3me sér, 8, 9. Type: *H. cornucopiæ*, Defr. *Capulus* (part), Montfort, 1810. *Amalthea a*, Schumacher, 1817; not *Amaltheus*, Montfort, 1810. *Pileopsis* (pars), Lamarck, 1822. *Hipponyx*, Blainville, 1824. *Krebsia*, Mörch, 1877. *Malluvium*, Melvill, 1906.

Animal oval or suborbicular, conical or depressed; foot very thin, a little thickened towards the margin; head globose, separated from the body by a neck-like constriction; eyes upon swellings of the tentacles.

Shell thick, obliquely conical, non-spinal, apex somewhat posterior and directed backwards, surface rugose or longitudinally grooved or cancellated; muscular impression horseshoe-shaped; base of attachment (opercular piece), when present, thick.

Distribution.—Warm seas.

Fossil.—Cretaceous to Pliocene.

Found fossil in New Zealand: *H. radiatus*, Hutton, in the Miocene.

1. **Hipponix hexagonus**, Suter, 1906. Plate 44, fig. 1.

Amalthea hexagona, Sut., T.N.Z.I., xxxviii, 1905 (1906), 326. *Hipponyx cornucopiæ*, Lamarck: Hutton, C.M.M., 32; not of Lamarck. *H. australis*, Lam.: Hutton, J. de Conch., 1878, 30; M.N.Z.M., 88; not of Lamarck.

Shell solid, conical or depressed, with a posterior apex. *Sculpture:* Young shells show strong radiate riblets, crossed by very numerous concentric lamellæ; adult shells have almost always a rugose surface, the sculpture of the young shell having been lost through corrosion, sometimes, however, traces of the riblets may be seen near the margin, and concentric ridges can be distinguished. *Colour* greenish-white; the interior has a light-green central area, the margin light purple. *Aperture* more or less distinctly hexagonal, but rarely pentagonal; margin sharp, uneven, sometimes slightly denticulate; muscular impression distinct, horseshoe-shaped, rather narrowly open in front.

Diameter, maj., of aperture, 22 mm. (large specimen); height varying from about 6 mm. to 10 mm.

Dentition unknown.

Type in my collection.

Hab.—Tauranga (type); Chatham Islands; South-west Point, Bluff (Captain Bollons).

Remarks.—Captain Bollons found the shells forming a cluster on a rock, closely in touch with one another, hence the more or less hexagonal outline of the shells.

Fam. CALYPTRÆIDÆ, Broderip.

Animal with a distinct head and lengthened muzzle, slit at its extremity; tentacles subulate, carrying eyes near their external base; foot short, rounded oval; the single branchia finely and deeply pecti-

nated ; adductor muscle horseshoe-shaped or oval ; jaws rudimentary. Visceral mass spiral, lateral cervical lobes present, and there are accessory genital glands. Radula with a subquadrangular central tooth, the margin pectinated, the central cusp longer ; lateral teeth with denticulate margins ; marginals narrow, curved, denticulate.

Shell conic, patelliform, the summit more or less spiral ; interior polished, porcellanous, chambered by a basal plate or variously shaped process, supporting the viscera ; peristome entire. No operculum or attached base.

The *Calyptræidæ* are found adhering to stones and shells ; most of them appear never to quit the spot on which they first settle, as the margins of their shells become adapted to the irregularities of the surface beneath. The form and colour of the shell both depend somewhat upon the situation in which it grows : those found on the inside of the mouth of dead shells are generally flat or even concave above, and white ; those attached to the outside of shells are convex, and coloured. The animal is supposed to feed on seaweeds and animalcules. They sometimes cover and hatch their spawn under the forepart of the foot.

Vernacular Names.—Bonnet, slipper, and cup-and-saucer limpets.

KEY TO GENERA.

a. Shell conical, trochiform ; interior with a spiral diaphragm .. CALYPTRÆA.
aa. Shell oval, limpet-like : interior with a lamina, covering the posterior half of the aperture .. .. CREPIDULA.

Genus 1. CALYPTRÆA, Lamarck, 1799.

Calyptræa, Lam., Prodrome Nouveau Class., 1799, 78 ; not Lamarck, 1801. Type : *C. chinensis*, L. *Infundibulum*, Sowerby, 1812. *Trochita*, Schumacher, 1817. *Galerus* (Humphrey), H. and A. Adams, 1854. *Leptonotis*, Conrad, 1866 (very young shell). (For full list of synonyms see W. H. Dall, U.S. Geol. Survey, Professional Paper 59—"The Miocene of Astoria and Coos Bay, Oregon," 1909, 81.)

Animal having a short head, the muzzle bilobed ; tentacles rather short, cylindrical, with the eyes on tubercles at their exterior base ; foot short, rounded, obtuse behind, angular in front.

Shell conical, trochiform, with a lateral spiral apex ; aperture basal, circular, entire ; interior furnished with a spiral basal plate, the columellar margin of which is twisted, forming a false umbilicus, free margin convex.

The Recent species are tropical and subtropical in their distribution.

Fossil.—The genus first appears in the Lower Cretaceous.

Subgen. 1. CALYPTRÆA, s. str.

Trochatella, Lesson, 1830. *Clypeola*, Gray, 1867.

Summit central or subcentral.

KEY TO SPECIES.

a. Shell rather small, thin, conoidal, depressed .. .. .. *scutum.*
aa. Shell large, thick, solid, conic, elevated .. .. .. *alta.*

1. Calyptræa scutum, Lesson, 1830. Plate 44, fig. 4.

Calyptræa scutum, Lesson, Voy. Coq., Zool., ii, 1830, 395; Man. Conch. (1), viii, 122; Index, 79. *Trochita scutum*, Lesson: Hutton, J. de Conch., xxvi, 30; M.N.Z.M., 86. *Calyptræa* (*Clypeola*) *tenuis*, Gray, P.Z.S., 1867, 735. *Trochita tenuis*, Gray, C.M.M., 32.

Shell conoidal, with a nearly central elevated apex, circular or slightly oval, thin and fragile. *Sculpture* consisting of oblique fine radiate riblets, sweeping forwards in a long curve, and cut up into small elongated tubercles by the growth-lines. *Colour* light brown or cinereous. *Epidermis* very thin, horny. *Spire* conoidal towards the base, conic and elevated towards the apex. *Protoconch* small, slightly oblique to the vertical axis, central or subcentral, consisting of $1\frac{1}{2}$ to 2 convex, smooth, and deeply sutured whorls. *Whorls* about 4, very rapidly increasing, flatly convex. *Suture* inconspicuous. *Aperture* entire, rounded, porcellanous, and shining; margin thin and sharp. *Basal plate* smooth and shining, with a few fine growth-striæ, the edge slightly concave, loosely coiled up, so as to leave a free space in the centre, up which the apex can be seen.

Diameter—Maj., 23 mm.; min., 20 mm.: height, 12 mm. (very large specimen). Diameter—Maj., 13 mm.; min., 12 mm.: height, 4 mm. (usual size).

Animal unknown.

Type in the Mus. Hist. Nat., Paris.

Hab.—Throughout New Zealand, in depths from 2 to 110 fathoms; Stewart Island, in 18 fathoms (Captain Bollons); Lyttelton Harbour, in 2 to 4 fathoms (H. S.); Hauraki Gulf, in 4 to 25 fathoms (H. S.); off Little Barrier Island, in 110 fathoms. Also Victoria (Gatliff).

Remark.—Sometimes the radiate riblets are absent.

Fossil in the Pliocene.

2. Calyptræa alta, Hutton, 1885. Plate 44, fig. 2.

Trochita alta, Hutt., T.N.Z.I., xvii, 1884 (1885), 329. *Calyptræa alta*, Hutt., Plioc. M., 62, pl. 7, f. 59; Suter, T.N.Z.I., xxxviii, 326.

Shell rather large, solid, conical, high. *Sculpture* consisting of oblique, close, rugose, elevated growth-striæ. *Colour* yellowish-brown, the summit sometimes purplish. *Epidermis* thin and horny. *Spire* conical; outlines convex. *Protoconch* small, of $1\frac{1}{2}$ convex, smooth, white, and polished whorls. *Whorls* 4, rapidly increasing, flatly convex. *Suture* distinct, not much impressed. *Aperture* entire, subcircular, polished. *Basal plate* white, shining, with oblique growth-lines; margin thin, sharp. *Columella* short, arcuate, slightly reflexed, and forming a very narrow false umbilicus.

Diameter, 25 mm.; height, 16 mm. (type—Miocene fossil). Diameter—Maj., 32 mm.; min., 29 mm.: height, 20 mm. (Recent specimen).

Animal unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—Cape Maria van Diemen (McGahey); Manukau (*fide* W. H. Webster).

Fossil.—Miocene and Pliocene.

Subgen. 2. SIGAPATELLA, Lesson, 1830.

Sigapatella, Lesson, Voy. Coq., Zool., ii, 389. *Haliotoidea*, Swainson, 1840. *Trochella*, Gray, 1867. *Calyptropsis*, Tate, 1893.

Shell oval, with lateral apex; basal plate with submarginal axis; the free margin concave.

3. **Calyptræa maculata,** Quoy and Gaimard, 1835. Plate 14, figs. 3, 3*a*.

Crepidula maculata, Q. & G., Voy. Astrol., iii, 1835, 422, pl. 72, f. 6–9. *Calyptræa novæ-zelandiæ*, Lesson, Voy. Coq., 1830, ii, 395. *C. dilatata*, Sow.: Gray, in Yate N.Z., 308, and Dieff. N.Z., 243. *Trochita maculata*, Q. & G., Crit. List., 28. *T. novæ-zealandiæ*, Less.: Hutton, J. de Conch., 1878, 30; M.N.Z.M., 86; Conch. Icon., Trochita, xi, pl. 3, f. 15. *Galerus neozelanicus*, Less.: Hutton, P.L.S. N.S.W., ix, 938. *Calyptræa calyptræformis*, Lam.: Tryon, Man. Conch. (1), viii, 122. pl. 35, f. 98, 99; not of Lamarck. *C. novæ-zeelandiæ*, Lesson: Suter, T.N.Z.I., xxxviii, 326.

Shell rounded, convex, rather thin, with a lateral summit. *Sculpture* consisting of well-marked, flattish, and rugose growth-lines. *Colour* greenish-yellow to light brown; interior white, a large spot of purple or purplish-brown near the centre. *Epidermis* thick, horny, lamellate in the direction of the growth-periods, and produced into rays and ragged processes. *Spire* small, conic, salient, lateral, and posterior. *Protoconch* small, of $1\frac{1}{2}$ convex whorls, the first smooth, the following half with a few microscopic growth-lines and spiral striæ. *Whorls* 3 to 4, convex, the last very large. *Suture* superficial. *Aperture* roundly oval, entire, polished. *Basal plate* white, with very fine growth-lines, the free margin thin, sharp, lightly concave. *Columella* lateral, dilated at its insertion, and furnished with a triangular lamina, which partly hides the rather wide false umbilicus.

Diameter—Maj., 33 mm.; min., 28 mm.: height, 10 mm. (large specimen).

Dentition.—Hutton, T.N.Z.I., xiv, 163, pl. 7, f. A.

Type in the Mus. Hist. Nat., Paris.

Hab.—Throughout New Zealand and at the Chatham Islands. Brought to England by Captain Cook.

Remarks.—The species was first figured by Quoy and Gaimard, and their name therefore stands in preference to the earlier name of Lesson. Young shells have mostly the basal plate white, and the whole roof purplish-brown. The height of the shell is very variable.

Fossil.—Miocene and Pliocene.

Genus 2. Crepidula, Lamarck, 1799.

Crepidula, Lam., Mém. Soc. Hist. Nat. Paris, 1799, 78. Type: *Patella fornicata*, L. *Proscenula*, Perry, 1811. *Crypta*, Humphrey, 1797 (name only).

Animal with head depressed, laterally dilated, muzzle short, bilobed; tentacles short, subulate; foot short, subtruncate in front, rounded behind.

Shell oval, patelliform, with a posterior generally lateral spiral apex; interior with a basal plate covering the posterior half of the aperture.

Adhering to shells or stones, and modifying the form and surface in accordance with the inequalities of their place of attachment.

The distribution is world-wide; the individual species have a wide range, which, added to their great variability, as in attached shells generally, has caused an enormous specific synonymy.

Fossil.—Cretaceous and Tertiary. In the Miocene the genus exhibits luxuriance both in size and variation.

Vernacular Name.—Slipper-limpet.

Key to Species.

A. Upper surface nearly smooth, high convex or flattened, sometimes concave .. .. *crepidula.*
B. Upper surface with radiating nodulous or spinose ridges .. *costata.*

1. Crepidula crepidula, Linné, 1764. Plate 44, figs. 5, 5*a*.

Patella crepidula, L., Mus. Lud. Ulricæ, 1764, 689; Favanne, "Conchyliologie," pl. 4, f. D. *Crepidula unguiformis*, Lamarck, A.s.V., vii, 1822, 642. *Calyptræa* (*Crepidula*) *monoxyla*, Lesson, Voy. Coq., ii, 1830, 391. *Crepidula monoxyla*, Lesson, Man. Conch. (1), viii, 128, pl. 37, f. 35, 36; 130, pl. 39, f. 66–68. *C. contorta*, Q. & G., Voy. Astrol., iii, 1835, 418, pl. 72, f. 15, 16. *Crypta profunda*, Hutton, C. Tert. M., 1873, 14.

Shell oval or oblong, high convex, flattened or concave above, often twisted, nearly smooth, but frequently somewhat lamellar. *Sculpture* consisting of close concentric growth-lines, slightly lamellar anteriorly; crossed by fine and close microscopic radiate striæ, distinctly visible on the neanic part of the shell, but very often obsolete on the remainder of the upper surface. *Colour* white or yellowish-white. *Epidermis* very thin, horny, easily worn off. *Protoconch* of one-half whorl only, flatly convex and smooth; in young shells it is at the posterior fourth, but in adult shells it is mostly terminal. Shells living on stones or other shells are flatly or very highly convex, those, however, living in the interior of dead gastropod shells are quite flat or concave above. *Interior* porcellanous, highly polished; the posteriorly situated basal plate convex, with a sharp slightly concave margin, the length of the plate being about one-fourth of the length of the shell.

Length of adult shell, 20–25 mm.; the breadth and height are extremely variable.

Dentition.—Hutton, T.N.Z.I., xv, 122, pl. 14, f. B; xvi, 214: Gray, Guide Moll. B.M., 115.

Hab.—Throughout New Zealand, from low-water mark to about 40 fathoms. The species is cosmopolitan.

Remarks.—The *C. crepidula*, L., and *monoxyla*, Less., were hitherto considered to be distinct species. Pritchard and Gatliff, however, united them under *C. unguiformis*, Lam. The dentition of the two does not show any marked difference, and the protoconch as well as the nepionic shells show the same characters. The shells are mostly found upon *Turbo smaragdus*, and in the mouth of *Siphonalia*, &c.

Fossil.—Miocene and Pliocene.

2. Crepidula costata, Sowerby, 1824. Plate 44, figs. 6, 6*a*.

Crepidula costata, Sow., Gen. of Recent & Foss. Shells, No. 23, f. 3. *Patella aculeata*, Gmelin, Syst. Nat., ed. xiii, 3693. *C. costata*, Sow., Voy. Astrol., iii, 1835, 414, pl. 72, f. 10–12. *C. aculeata*, Gmel., Man. Conch. (1), viii, 129, pl. 39, f. 61–65; Chall. Rep., xv, 458.

Shell oval, moderately convex, solid, radiately strongly ridged. *Sculpture* consisting of strong radiating nodulose or spinose ridges, often interrupted by periods of rest; interstices with more or less numerous radiate striæ; growth-lines prominent, and lamellar on the anterior part of the shell. *Colour* whitish, yellowish, or brownish, often chestnut-rayed; interior often blotched or rayed with brown or purple; basal plate white. *Epidermis* very thin, horny, deciduous. *Protoconch* minute, oblique, of 1 smooth and flatly convex whorl, mostly with a few brown lines; the nepionic shell has very fine concentric growth-lines, but no radiate sculpture. The shell is flatly to highly convex, with the apex lateral, posterior, and terminal. *Interior* porcellanous, polished, the margin of the roof more or less denticulate. *Basal plate* flat or convex, free margin sharp, almost straight; length of the plate somewhat over one-third of the total length of the shell.

Length, 50 mm.; breadth, 31 mm.; height, 18 mm. (large specimen).

Dentition.—Hutton, T.N.Z.I., xv, 122, pl. 14, f. A.

Type in the British Museum.

Hab.—North Island of New Zealand. Brought to England by Captain Cook.

Remarks.—Sowerby's species was first figured, and his specific name has to be adopted. This again is a cosmopolitan species. Gray (P.Z.S., 1867, 737) mentions the following species as synonyms: *C. echinus* and *hystrix*, Broderip; *C. californica*, Nuttall.

Fossil.—Miocene and Pliocene.

Fam. **NATICIDÆ**, Swainson.

Animal with small tentacles, which are lanceolate, wide apart, connected by a veil; eyes absent or placed under the skin, behind the tentacles; foot highly developed and provided with an aquiferous

system, much produced in front, where it is furnished with a fold (propodium) covering the head and anterior margin of the shell; operculigerous lobe very ample, partially enveloping the shell; mantle enclosed. Jaws corneous, waved or tessellated, subtrigonal. Central tooth of the radula trapezoidal, generally tricuspidate; lateral teeth with a central large and smaller cusps; inner marginals simple or bifid; outer marginals simple.

Shell turbinate, subglobose or auriform, the spire usually short; aperture entire, without canal or sinus; the outer lip sharp, not reflected or margined; the inner lip callous, more or less reflected over the umbilicus. Operculum calcareous or corneous, paucispiral.

The animals of *Naticidæ*, characterized by the cephalic disc forming the propodium, are completely retractile within the shell in the typical *Natica*, but not retractile in some other forms. The nidus is unlike that of any other mollusc in form and composition, being built up largely of the sand of the sea-bottom, agglutinated into a strap, forming part of a circle, and provided on one side with a constriction or rim; the walls contain the eggs, arranged in quincunx order.

The *Natica* is an active animal, carnivorous and very predaceous, living in sandy places, where it hides under the surface, and burrows for bivalves; these it pierces with its tongue, boring a round hole, generally near the beaks, where the shell of the victim is thinnest.

Key to Genera.

A. Operculum calcareous .. .. Natica.
B. Operculum horny.
a. Aperture not very large, columella nearly straight .. Polinices.
aa. Aperture very large, columella curved, S-shaped .. Ampullina.

Genus 1. Natica, Scopoli, 1777.

Natica, Scopoli, Introd. Hist. Nat., 1777, 392. Type: *Nerita vitellus*, L. *Natica*, Scopoli: Bruguière, Enc. Méth., i, p. xvi, 1789; Lamarck, Prodrome, 1799, 77. *Cochlis*, Bolten, 1798. *Nacca*, Risso, 1826.

Animal with large cephalic lobe, truncated in front, subquadrangular.

Shell oval-globular, porcellanous, solid, generally smooth, covered by a fine epidermis, which is transparent and generally not very persistent; umbilicated, or umbilicus more or less filled with callus; aperture semilunar, vertical, the outer lip simple. Operculum large, semilunar, paucispiral, calcareous.

The species are numerous; mostly inhabitants of the warm seas, in all quarters of the globe. The genus first appeared in the Jurassic formation. The fossil forms are remarkable for the persistence of their colours.

Vernacular Name.—Necklace-shell.

Key to Species.

A. Umbilicus with a white, central, entering callus; shell of moderate size .. .. *zelandica.*
B. Umbilicus partly covered by a brown not entering callus; shell small .. .. *australis.*

1. Natica australis, Hutton, 1878. Plate 15, fig. 16.

Lunatia australis, Hutt., J. de Conch., xxvi, 1878, 23; T.N.Z.I., x, 295; M.N.Z.M., 72. *Natica australis*, Hutt., P.L.S. N.S.W., ix, 934; Plioc. M., 54, pl. 7, f. 38.

Shell small, globose, fairly solid, polished, smooth, umbilicate. *Sculpture* consisting of very fine and close growth-lines, crossed by faint microscopical striæ. *Colour* either uniformly brown with a few lighter blotches, or cinereous with radiate flexuous narrow brown bands, a series of triangular whitish spots revolving a short distance below the suture, and irregular-shaped white streaks issuing from the umbilicus; peristome light brown. *Epidermis* thin, transparent, shining. *Spire* low, depressed conoidal, lower than the height of aperture; outlines convex. *Protoconch* small, with a comparatively large nucleus, of 1½ smooth flattish whorls. *Whorls* 3½, convex, the last large in proportion; base convex. *Suture* lightly impressed. *Aperture* subvertical, semilunar, inside dark brown. *Outer lip* convex, with a rather blunt edge. *Columella* subvertical, thick and callous, curved below towards the basal lip. *Inner lip* strongly callous, triangularly produced over half of the umbilicus, and forming a thick brown and shining callus on the parietal wall. *Umbilicus* moderate, the outer half open. *Operculum* calcareous, paucispiral, with distant growth-lines and close spiral striæ.

Diameter, 7·5 mm.; height, 7·5 mm. (type).

Animal unknown.

Type in the Otago Museum, Dunedin.

Hab.—Auckland Harbour, dredged in Rangitoto Channel, type (T. F. Cheeseman); off Great Barrier Island, in 110 fathoms; Snares, in 50 fathoms (Captain Bollons).

Remarks.—The specimens from 110 fathoms are white, semitransparent, occasionally with a few radiate brown bands. The inner lip is by far not so strongly callous, and leaving sometimes the umbilicus quite open.

Fossil in the Pliocene.

2. Natica zelandica, Quoy and Gaimard, 1832. Plate 44, figs. 7, 7*a*.

Natica zelandica, Q. & G., Voy. Astrol., ii, 1832, 237, pl. 66, f. 11, 12; Dieff. N.Z., 241; Conch. Icon, ix, pl. 20, f. 90; Man. Conch. (1), viii, 22, pl. 4, f. 70.

Shell globose, rather thin, smooth and polished, with a funiculate umbilicus. *Sculpture* consisting of fine, close, subequal growth-lines, flexuous and stronger below the suture; these are crossed by numerous microscopic undulating spiral striæ. *Colour* yellowish-fawn, with 5–6 whitish spiral bands painted with chestnut-coloured arrow-headed markings, a narrow whitish band margining the suture below; base white. *Epidermis* very thin, shining. *Spire* lateral, conoidal, much lower than the height of aperture; outlines convex. *Protoconch* depressed convex, of 2 smooth convex whorls. *Whorls* 5½ to 6, first

very slowly then rapidly increasing, the last very large, convex; base rounded. *Suture* well marked, not impressed. *Aperture* oval, subvertical, interior light brown with a few lighter bands, white and callous inside the margins. *Outer lip* convex, thin and sharp. *Columella* oblique, porcellanous, arcuate below. *Inner lip* forming a strong semicircular white callus, entering the umbilicus, and sometimes nearly filling it up, leaving only a channel and a narrow chink above, spreading above as a thin white callosity over the parietal wall. *Umbilicus* with a distinct yellow callus spreading over part of the base. *Operculum* semilunar, calcareous, paucispiral, nucleus near the lower inner margin, inside with a yellowish horny and polished epidermis, with radiate growth-lines and a few median spiral striæ.

Diameter, 21 mm.; height, 24·75 mm. (type). Diameter, 26 mm.; height, 28 mm. (large specimen). Diameter, 19 mm.; height, 22 mm. (the usual size).

Animal unknown.

Type in the Mus. Hist. Nat., Paris.

Hab.—Throughout New Zealand and at the Chatham Islands; near Resolution Island, in 12 fathoms; Stewart Island, in 18 fathoms; off Great Barrier Island, in 110 fathoms; Hauraki Gulf, in 25 fathoms; Kermadec Islands.

Fossil.—Miocene and Pliocene.

Genus 2. Polinices, Montfort, 1810.

Polinices, Montfort, Conch. Syst., ii, 1810, 223. Type: *Nerita mammilla*, L. *Natica*, Risso, 1826; not of Lamarck, 1799. *Albula*, Bolten, 1798; not of Gronovius, 1763. *Neverita*, Risso, 1826. *Euspira*, Agassiz, 1842 (in part). *Lunatia*, Gray, 1847. *Cepatia*, Gray, 1840. *Velainia*, Munier-Chalmas, 1884. *Naticina*, Fischer, 1885; not of Guilding, 1834. *Sigaretopsis*, Cossman, 1888.

Shell oval-elongate, subglobular or depressed, generally smooth, umbilicated or having the umbilicus closed by a callus. Operculum corneous, paucispiral, semilunar, having the nucleus nearly lateral, concave externally.

Fossil in the Tertiary.

1. **Polinices amphialus,** Watson, 1881. Plate 46, fig. 1.

Natica amphiala, Wats., J.L.S., xv, 1881, 260; Chall. Rep., xv, 1886, 437, pl. 27, f. 6. *Natica vitrea*, Hutton, C.M.M., 21. *Lunatia vitrea*, Hutt., M.N.Z.M., 72.

Shell thick, depressedly globose, with a small scalar rather elevated spire and a narrow obliquely pointed base, pale yellow, umbilicated. *Sculpture:* Longitudinals—there are many fine close-set lines of growth; spirals—there are a few faint traces of obsolete lines and furrows, there is a slight angulation round the mouth of the umbilical pore. *Colour* is slightly brownish-yellow, but is pure porcellanous-white below the epidermis, which is thin, slightly puckered, smooth, not glossy, persistent. *Spire* short, but abrupt and scalar. *Proto-*

conch rather large, depressed convex, of 1½ smooth whorls. *Whorls* 4½, narrow, flatly rounded, of gradual increase to the last, which is disproportionately large, especially toward the mouth. *Suture* strong, slightly channelled, almost quite horizontal. *Aperture* large, oval, very little oblique, and rather straight, scarcely pointed above; it is more than two-thirds of the whole height. *Outer lip* sharp but strong, patulous throughout. *Inner lip* straightish, but slightly concave in its whole length; it is expanded at the labial callus, which is thick, with a labial pad. The front of the *columella* is thickened and flattened back on the very indistinct circumumbilical carina. *Umbilicus* is a rather coarse, pervious, smallish, round hole, hardly encroached on at all by the inner lip; it is barely funiculate. *Operculum* membranaceous, thinnish, of a yellow colour, with a dark-maroon outer edge, which does not quite coil into the centre. (Watson.)

Diameter, 6·25 mm.; height, 6·75 mm. (type). Diameter, 8·5 mm.; height, 9 mm. (type of *P. vitreus*, Hutt.).

Animal unknown.

Type in the British Museum; of *P. vitreus*, in the Dominion Museum, Wellington.

Hab.—North-east from New Zealand, in 700 fathoms, Chall. Stat. 169 (type); Stewart Island (type of *P. vitreus*); Chatham Islands; Bounty Islands, in 50 fathoms (Captain Bollons).

Fossil in the Pliocene.

Genus 3. Ampullina (Lamarck), Bowdich, 1822.

Ampullina, Bowdich (as of Lam.), Elem. Conch., i, 1822, 31. Type: *Ampullaria depressa*, Lam.; not of Sow. *Ampullinopsis*, Conrad, 1865. *Megatylotus*, Fischer, 1885. *Amauropsis*, Mörch, 1857. *Globulus*, J. de C. Sowerby, 1835; not of Schumacher, 1817. *Euspira* (sp.), Desor and Agassiz, 1842. *Globularia*, Swainson, 1840. *Crommium*, Cossmann, 1888. *Amauropsella*, Chelot, 1885. *Amaurellina*, Fischer, 1885. *Ampullina*, Bowdich: W. H. Dall, U.S. Geol. Survey, Professional Paper 59—"The Miocene of Astoria and Coos Bay, Oregon," 1909, 89.

Shell naticiform; umbilicus without a funiculus, open or closed by a callosity; aperture large; outer margin sinuous, produced at the middle; umbilical region generally limited by a spiral rib or limb more or less developed; columella-border curved, typically S-shaped.

Fossil in the Tertiary.

Key to Species.

A. Two low rounded ribs on the umbilical area .. .. .. *venusta.*
B. Umbilical area without ribs .. .. *undulata.*

1. Ampullina undulata, Hutton, 1885. Plate 15, fig. 17.

Sigaretus undulatus, Hutt., T.N.Z.I., xvii, 1884 (1885), 318, pl. 18, f. 11; Plioc. M., 55, pl. 7, f. 41; Webster, T.N.Z.I., xxxvii, 280.

Shell moderately large, subglobose, nearly smooth, thin and fragile, umbilicus sealed up. *Sculpture:* Fine oblique and flexuous growth-lines, crossed by delicate, close, undulating spiral lines, more distant

and broader upon the base. *Colour* light-yellowish or white. *Spire* very low, arched, with the apex a little raised, less than one-third the height of the aperture. *Protoconch* consisting of $2\frac{1}{4}$ smooth flattish whorls. *Whorls* $4\frac{1}{2}$, first slowly increasing, but the last very large, flatly convex; base convex. *Suture* impressed. *Aperture* ovate, rather produced anteriorly. *Outer lip* convex, thin and sharp, slightly produced in the middle. Parietal wall and columella together are S-shaped. *Columella* vertical, arcuate, curved off towards the slightly convex basal lip. *Inner lip* spreading as a fairly thick callus beyond the columella, covering up the umbilicus, and extending over the parietal wall. *Operculum* unknown.

Diameter, 21 mm.; height, 21 mm. (type).

Animal unknown.

Type, from the Pliocene, in the Canterbury Museum, Christchurch.

Hab.—Cape Maria van Diemen (*teste* Webster).

Remarks.—I have seen no Recent specimen. The description is made from a fossil shell from Wanganui.

Fossil in the Pliocene.

2. **Ampullina venusta,** Suter, 1907. Plate 15, fig. 18.

Euspira venusta, Suter, P. Mal. S., vii, No. 4, March, 1907, 215, pl. 18, f. 13.

Shell large, globose, white, imperforate, with 2 low spiral ribs round the umbilical region. *Sculpture* consists of close, unequal, spiral, slightly wavy lines, which are crossed by subequidistant fine growth-lines, interspersed with distant strong and flexuous radial folds, very likely marking periods of rest. *Colour* light bluish-white, porcellanous. *Spire* conoidal, about a quarter the height of the shell. *Protoconch* depressedly globose, formed by $2\frac{1}{2}$ smooth and convex whorls. *Whorls* $5\frac{1}{2}$, first slowly then rapidly increasing, convex, the last whorl very large and rounded; base convex; 2 low and broadly rounded ribs encircling the umbilical region, the outer rib beginning at the lower third of the penultimate whorl and terminating at the junction of the outer with the basal lip. *Suture* not deep, on the last $1\frac{1}{2}$ whorls with a milk-white broad inferior band. *Aperture* large, broadly ovate below, much excavated above by the penultimate whorl. *Outer lip* broadly rounded, thin and sharp. *Inner lip* spreading as a thin and broad callus over the body-whorl, but forming a thick white and shining callus on the concave columella; the columellar border and parietal wall regularly S-shaped. *Basal lip* narrowly rounded, not produced. The *columella* does not form a vertical solid pillar, but is wound up in a spiral, leaving a free space, of about 3 mm. diameter at the base, up which the apex can be seen. *Operculum* unknown.

Diameter, 37 mm.; height, 40 mm.

Animal unknown.

Type in my collection.

Hab.—Near Cape Farewell.

3. Ampullina apora, Watson, 1881.

Natica (*Amauropsis*) *apora*, Watson, J.L.S., xv, 1881, 265; Chall. Rep., xv, 454, p. 27, f. 11. *Amaura apora*, Wats., Index, 80.

Shell conical-oval, thin, umbilicated, with a coarse brown epidermis and a channelled suture.

Diameter, 16·25 mm.; height, 18 mm.

Hab.—The type is from the Arron Islands, in 800 fathoms.

There is a species of *Natica* from Chall. Stat. 169, north-east from New Zealand, 700 fathoms, which may perhaps be this species, but it is in too bad condition for identification. (Watson.)

Fam. LAMELLARIIDÆ, d'Orbigny.

Animal having a short muzzle; tentacles subulate, with the eyes at their exterior bases; foot lanceolate, simple, without a cephalic disc. The mantle gradually grows over the shell until the latter becomes, in some of the genera, completely internal. Intromittant organ falcate, on the right side of the body; there are 2 unequal branchiæ. Jaws are present. The radula has the formula $2 + 1 + 1 + 1 + 2$ or $1 + 1 + 1$.

Shell thin, more or less internal, sometimes reduced to a non-spiral lamella, generally spiral, with a short lateral and paucispiral spire; aperture large, entire, oval. No operculum.

The *Lamellariidæ* are carnivorous, living upon *Hydrozoa*, *Alcyonaria*, and compound *Ascidiæ*. The eggs are deposited in the midst of colonies of the latter. The first embryonic shell is nautiloid, with spiral ridges; the second is more simple, resembling a *Carinaria*. These shells are united at their margins by a thin membrane. The pelagic larval forms have received the names of *Brownia*, *Echinospira*, *Calcarella*, and *Jasonilla*.

Genus 1. Lamellaria, Montagu (pars), 1815.

Lamellaria, Mtg., Trans. Linn. Soc., xi, 1815, 11. Type: *L. perspicua*, L. *Coriocella*, Blainville, 1824. *Cryptothyra*, Menke, 1830. *Marsenia*, Leach, 1847. *Chelinotus*, Swainson, 1840. *Cryptocella*, H. and A. Adams, 1853. *Ermea*, Gray, 1857.

Animal much larger than the shell, which is entirely concealed beneath the dorsal shield; shield thick, verrucose, notched in front; foot elongated, truncated anteriorly, acuminated behind; eyes at the outer bases of the tentacles. Dentition $1 + 1 + 1$, the central tooth subtrigonal, with the free margin denticulated and base incurved; laterals large, the summit lanceolate, the margins denticulate; no marginals.

Shell internal, ear-shaped, thin, pellucid; spire lateral, very small; aperture large, patulous, both lips regularly arcuated; axis imperforate.

There are between twenty and thirty living species—Atlantic, Indian, and Pacific Oceans.

Fossil.—A few species are known from the Miocene, but not in New Zealand.

KEY TO SPECIES.

A. Shell rather large, auriform; axis widely open to the apex .. *cerebroides.*
B. Shell small, oval; axis narrowly open to the apex .. .. *ophione.*

1. **Lamellaria cerebroides,** Hutton, 1883. Plate 44 fig. 8.

Lamellaria cerebroides, Hutt., T.N.Z.I., xv, 1882 (1883), 122; M.N.Z.M., 59.
Marsenia cerebroides, Hutt., Index, 80.

Shell moderately large, auriform, thin and fragile, shining, white. *Sculpture* consisting of fine growth-striæ and folds, and there is just a trace of microscopic spiral striation. *Colour* a slightly yellowish white. *Epidermis* thin, transparent and rather iridescent, overlapping the peristome, and covering the inner lip. *Spire* very short, depressed. *Protoconch* minute, of 1½ oval whorls, which are smooth and flatly convex. *Whorls* 3½, rapidly increasing, the last very large, convex, flattened below the suture. *Suture* impressed. *Aperture* broadly ovate. *Outer lip* membranaceous, broadly arched. *Basal lip* horizontal. *Columella* broadly arcuate, with a thin and rather sharp edge. *Inner lip* forming a narrow, wrinkled, and yellowish band. *Axis* widely open to the apex.

Diameter—Maj., 22 mm.; min., 15 mm.: height, 14 mm.

Animal with the mantle smooth, but much wrinkled, resembling the convolutions of the brain, the shell completely internal. Colour reddish-brown, marbled with yellowish-grey; yellow when preserved in alcohol. The mantle is considerably expanded and waved laterally, trilobed in front. Tentacles short, subulate, with blunt tips; eyes at their outer side, sessile. The intromittant organ is large, drawn out to a fine point.

Dentition unknown.

Hab.—Near Dunedin, type (G. M. Thomson); Akaroa Harbour, at low-water mark (H. S.).

2. **Lamellaria ophione,** Gray, 1850. Plate 46, fig. 2.

Lamellaria ophione, Gray, P.Z.S., 1849 (1850), 169; A.M.N.H. (2), vii, 1851, 69. *L. Indica*, Leach: Hutton, C.M.M., 21; not of Leach. *Coriocella ophione*, Gray, M.N.Z.M., 59. *Marsenia ophione*, Gray, Index, 80.

Shell oblong, elongate, pellucid, thin, white. *Sculpture* consisting of fine growth-lines and folds, crossed by faint microscopic spiral striæ. *Colour* white. *Epidermis* very thin, transparent, lightly iridescent, and shining. *Spire* very small and short. *Protoconch* of 1½ smooth flattish whorls, the nucleus oval and minute. *Whorls* 3, very rapidly increasing, convex, the last very large. *Suture* impressed. *Aperture* oblique, broadly ovate. *Outer lip* sharp and thin, the epidermis usually overlapping. *Columella* concave, parietal wall convex. *Inner lip* spread as a narrow band over columella and parietal wall. The whorls are centrally loosely coiled up, leaving a narrow opening through which, looking up from the base, the apex can be seen.

Diameter—Maj., 11·5 mm. ; min., 8 mm. : height, 10 mm.

Animal with the mantle smooth, covering the whole shell, not fissured at the back, notched in front ; yellowish or white, marbled with grey, and usually with 2 blackish patches. Foot small, square in front, tapering behind, entirely covered by the mantle. Top of the head dark grey or purple ; eyes at the outer bases of the tentacles, which are large and distant. (Hutton, T.N.Z.I., xv, 121.)

Dentition 1 + 1 + 1 ; central tooth with the base produced into two long processes ; the anterior end slightly reflected and trilobed ; lateral teeth versatile, broad, situated at some distance from the central tooth, their apices acute, uncinate, and denticulated on the inner side. (Hutton, *l.c.*, 121, pl. 13, f. W.)

Type in the British Museum.

Hab.—Auckland, type (Greenwood) ; Narrow Neck Reef, Takapuna, and Orakei (H. S.) ; Islet Reef, Cook Strait ; Cape Farewell ; Kermadec Islands (Haylock) ; Snares, 50 fathoms, one young shell (Captain Bollons). Found under loose stones at low-water mark. Victoria, South Australia, and Tasmania.

Fam. **TRICHOTROPIDÆ**, Gray.

Animal with a short broad head ; tentacles somewhat distant, with eyes about their middle ; foot elongated ; siphon very short, but evident. Radula 2 + 1 + 1 + 1 + 2 ; the central tooth subquadrangular, multicuspid ; laterals large, transverse, with finely crenulated margin ; marginals curved, sharp, simple.

Shell thin, turbinated, carinated, the ridges bearing epidermal fringes in fresh or living specimens, umbilicated ; aperture angulated or subchannelled below, lip sharp, columella obliquely truncated. Operculum generally lamellar, with apical nucleus.

Key to Genera.

A. Shell turbinate, umbilicus narrow or closed .. .. Trichotropis.
B. Shell discoidal, largely umbilicate, the last whorl sometimes separated .. .. Lippistes.

Genus 1. Trichotropis, Broderip and Sowerby, 1829.

Trichotropis, B. & S., Zool. Journ., iv, 1829, 373. Type : *Turbo bicarinatus*, Sow. *Trichophora*, Deshayes, 1830.

Animal having the foot oval, lanceolate, rounded in front, angulate laterally, and attenuated behind. Intromittant organ falcate.

Shell thin, rather small, turbinate, dilated below. Spire short, angular, and shouldered. Whorls not numerous, first convex, then angular, ornamented with spiral cords, crossed by finer radiate sculpture ; epidermis fringed upon the ridges, but very easily rubbed off. Last whorl large ; base with a carina around the umbilicus. Aperture auriform, angled above, and terminating below in an angular beak. Columella smooth, concave, narrowed below.

Distribution.—Mostly Arctic and Antarctic.

Fossil in the English Crag, Pliocene of New Zealand, and Pleistocene of Canada.

1. Trichotropis clathrata, Sowerby, 1874. Plate 44, fig. 9.

Trichotropis clathrata, Sow., Conch. Icon., xix, pl. 2, f. 10; Ereb. & Ter., ii, 3, pl. 1, f. 21; Man. Conch. (1), ix, 43, pl. 7, f. 51. *T. inornata*, Hutton, C.M.M., 26; M.N.Z.M., 69.

Shell small, fusiform, thin, cancellate, narrowly umbilicate. *Sculpture* consisting of prominent spiral threads, 3 of them upon the shoulder of the whorls between suture and carina, and 3 more prominent threads on the keel and below it on the spire-whorls, about 10 on the body-whorl; these are cancellated by slightly oblique and distant radiate riblets, much less prominent than the spiral sculpture; granulate at the points of intersection; a strong rounded carina bordering the umbilicus. *Colour* cinereous; dead shells yellowish-white. *Epidermis* present only in fresh or living specimens, thin, horny, fringed upon the ridges. *Spire* more or less elevated, conical, mostly of about the same height as the aperture. *Protoconch* small, of 1 smooth and globose whorl. *Whorls* about 5, angled, carinated above, the last of very large size; base slightly depressed around the beak. *Suture* canaliculated. *Aperture* very large, vertical, subtrigonal. *Outer lip* convex, slightly expanded in adult specimens, margin crenate. *Basal lip* oblique, forming with the anterior end of the columella a short, narrow, and open canal. *Columella* high, lightly concave, with a small projecting angle at the base, then narrowing and forming the inner margin of the canal. *Inner lip* strongly callous, narrowly reflected, and joining above the outer lip. *Umbilicus* narrow, channelled. *Operculum* horny, light brown, longitudinally striate; apex anterior.

Diameter, 10 mm.; height, 16 mm. Angle of spire, about 40°.

Animal unknown.

Type of *T. inornata* in the Dominion Museum, Wellington; of *clathrata*, in the British Museum.

Hab.—Throughout New Zealand, in deep water; Chatham Islands; Bounty and Snares Islands, in 50 fathoms (Captain Bollons).

Remark.—Hutton's species having never been figured, Sowerby's name has to be used.

Fossil in the Pliocene.

Genus 2. Lippistes, Montfort, 1810.

Lippistes, Mtft., Conch. Syst., ii, 1810, 217. Type: *Argonauta cornu*, Gmel. (= *Grayi*, A. Ad.). *Separatista*, Gray, 1847 (type, *Turbo separatista*, Dillwyn); Fischer, Man. Conch., 690; Ad. G.R.M., i, 136; Hedley, P.L.S. N.S.W., xxvii, 23.

Shell subdiscoidal, with a short spire, the last whorl usually separated from its predecessors, forming a very large umbilicus; aperture slightly channelled at the base. Operculum with apical nucleus.

Dentition 2 + 1 + 1 + 1 + 2; the central tooth with a multicuspidate margin; laterals transversely quadrangular, with a multicuspidate border; marginals arcuate and sharp.

Distribution.—West Indies, Japan, Philippines, Australasia, South Africa. Only a small number of species are known, and they live in depths from about 10 to 50 fathoms.

1. Lippistes Benhami, Suter, 1902. Plate 15, fig. 19.

Separatista Benhami, Sut., J. Mal., ix, 1902, 65, fig. in text. *Lippistes Benhami*, Sut., Index, 79.

Shell small, fragile, subdiscoidal, with a very short spire and broadly expanded aperture, cancellated, and with deep umbilicus. *Sculpture* consisting of numerous distinct spiral threads, about 12 on the body-whorl, but bifurcating and thus increasing in number on reaching the outer lip; in the shallow grooves between the threads there is a fine median line, recognisable only under a good lens; the axial ornamentation represented by numerous broad, rounded, sinuated costæ, which become more pronounced and more distant towards the aperture; points of intersection granulate; fine equidistant and numerous growth-lines cross the spiral threads. *Colour* yellowish-white, semi-transparent, flinty. *Spire* very low, conoidal. *Protoconch* consisting of 1½ smooth and glossy whorls. *Whorls* 3, rapidly increasing, body-whorl with a flat shoulder and distinct angle, the larger lower portion strongly convex. *Suture* first impressed, then, on reaching the aperture, channelled. *Aperture* widely expanded, oval, straight above, subangulated at the base. *Outer lip* patulous throughout, sharp, sinuated below the angle. *Columella* subvertical, slightly concave. *Inner lip* broadly reflected, continuous with the outer lip, and very slightly detached from the penultimate whorl. *Umbilicus* not broad, but deep, and carinated by the lowest spiral riblet. *Operculum* unknown.

Diameter, 7 mm.; height, 6·5 mm. Aperture—height, 6 mm.; breadth, 6 mm.

Animal unknown.

Type in the Otago Museum, Dunedin.

Hab.—Cape Maria van Diemen, type (Rayner).

Fam. **JANTHINIDÆ**, Fischer.

Animal having a proboscidiform rostrum, tentacles bifid; eyes absent; foot short, provided with an epipodium, and secretes a float, which is an elongated vesicular body sustaining these pelagic animals, and to which the eggs are attached. The sexes are separate, and there is no copulatory organ. No jaws. Teeth of radula elongated.

Shell thin, fragile, turbinated; whitish or purplish; aperture oval or subtetragonal; the columella a little twisted; lip simple, curved. No operculum.

These molluscs are carnivorous; they secrete a purple fluid, which is ejected from the branchial cavity when irritated. Some species are viviparous. The float can be detached spontaneously.

Genus 1. Janthina (Bolten), Lamarck. 1799.

Janthina, Bolten, Mus. Bolten. (2), 1798, 75; Lamarck, Prodrome, 1799, 75. Type: *Helix janthina*, L.

Head large, muzzle-shaped; tentacles forked, so that each appears like a pair; foot rather short, the epipodial lobe somewhat elongated and ciliated; branchial plumes 2, unequal. The radula is composed of a great number of elongated teeth; there is no central tooth.

The float is found in both sexes, and, whilst in the female the eggs are usually attached to the lower surface thereof, the animal in some species is viviparous; embryos taken from the uterus are operculated; the head has a ciliated velum; the eyes are large and well pigmented.

Shell imperforate, without epidermis, fragile, trochiform or turbiniform; nucleus small, styliform, oblique; spire light purplish-white, base deeper purple; whorls few, convex, with striæ of growth, angular or gathered at the periphery; outer lip with a sinus in the middle; columella thin, twisted.

About thirty species have been described from the Atlantic and Pacific Oceans, which Tryon reduced to three species and a few varieties.

A species is found in the Pliocene of Italy.

Vernacular Name.—Violet snail.

Key to Species.

A. Periphery subangled; sinus not very deep, rounded.
  a. The whole of the base violet, spire elevated .. .. *communis.*
  aa. A white band round the columella, spire depressed .. *balteata.*
B. Periphery rounded; sinus deep, sharply angular.
  a. Shell plicately radially striated, polished .. .. *globosa.*
  aa. Shell sharply radially striated, not polished .. .. *exigua.*

1. Janthina balteata, Reeve, 1858. Plate 44, fig. 10.

Janthina balteata, Reeve, Conch. Icon., xi, 1858, pl. 3, f. 11; Thes. Conch., v, 1882, 50, pl. 443, f. 12; Man. Conch. (1), ix, 36, pl. 9, f. 98. *J. fragilis*, var. *planospirata*, Ad. & Rve., Index, 80; not of Adams and Reeve.

Shell depressed globose, thin, with narrowly convex periphery. *Sculpture* consisting of oblique growth-striæ, situated at the periphery; crossed by inequidistant spiral lines, cut up by the radiate striæ, more conspicuous upon the base. *Colour:* Violet-white above, blue or violet beneath, with a conspicuous white band round the columella, which is very dark violet. *Spire* depressed conoidal, about one-third the height of the aperture; outlines convex. *Protoconch* minute, pupiform, oblique, of 3 smooth whorls. *Whorls* 6, slantingly convex; base flatly convex. *Suture* impressed. *Aperture* transversely oval,

broadly angled above, effuse at the base of the columella. *Outer lip* sharply rounded, slightly sinuate. *Basal lip* slightly convex, descending. *Columella* vertical, twisted, expanded below, and forming with the basal lip a triangular rounded point.

Diameter, 19 mm. ; height, 16 mm.

Animal unknown.

Type in the British Museum.

Hab.—North Island, more common on the west coast ; Kermadec Islands (Captain Bollons).

The type is from the Cape of Good Hope.

2. Janthina communis, Lamarck, 1839. Plate 44, fig. 11.

Janthina communis, Lam., A.s.V., ed. Desh. & Edwards, iii, 504 ; Conch. Icon., xi, pl. 1, f. 5 ; Thes. Conch., v, 50, pl. 443, f. 7 ; M.N.Z.M., 71 ; Man. Conch. (1), ix, 36, pl. 9, f. 99. *J. ianthina*, L. : Hutton, C.M.M., 6 ; not of Linnæus. *L. fragilis*, Lam., Index, 80 ; not of Lamarck.

Shell rather large, turbinate, thin. *Sculpture* consisting of fine oblique growth-lines and low folds, situated over the angle of the whorls ; crossed by very inequidistant spiral striæ, very distinct upon the base. *Colour* purplish-white above, violet below the angle. *Spire* conoidal, with a blunt apex, outlines convex. *Protoconch* minute, pupiform, oblique to the vertical axis, of 3 faintly spirally striated whorls. *Whorls* 7, flatly convex, sometimes slightly depressed below the suture, periphery bluntly angled ; base flatly convex. *Suture* impressed. *Aperture* subtetragonal, large, slightly angular above, effuse below the columella. *Outer lip* angularly convex, thin and sharp, slightly sinuous. *Basal lip* almost straight, descending. *Columella* vertical, thin, strongly twisted, flattened below, and produced with the basal lip into a point. *Parietal wall* slightly convex, with a very thin glaze spread over it.

Diameter, 21 mm. ; height, 17 mm. Diameter, 28 mm. ; height, 27 mm. (adult specimen).

Dentition.—Hutton, T.N.Z.I., xiv, 164, pl. 7, f. F.

Type in the Mus. Hist. Nat., Geneva.

Hab.—North Island, found washed up after gales.

3. Janthina exigua, Lamarck, 1822. Plate 44, fig. 12.

Janthina exigua, Lam., A.s.V., vi, 1822, 206 ; Conch. Icon., xi, pl. 5, f. 21 ; Thes. Conch., v, 51, pl. 444, f. 23, 24 ; Chenu, Man. Conch., i, 118, f. 519 ; Man. Conch. (1), ix, 37, pl. 10, f. 17.

Shell rather small, thin and fragile, radiately striated, with a deep sinus. *Sculpture* consisting of oblique, unequal, radiate, and flexuous striæ, with a deep angular sinus, forming a peripheral groove ; a few faint spiral striæ upon the base. *Colour* light violaceous, darker in the smaller specimens, with a white band below the suture. *Spire* short, conoidal, not quite half the height of the aperture. *Protoconch*

minute, pupiform, slightly oblique, of 3 convex and smooth whorls. *Whorls* about 7, slowly then rapidly increasing, convex; base convex. *Suture* impressed. *Aperture* large, semioval, produced below. *Outer lip* convex, thin and sharp, with a deep, sharply angular sinus in the middle. *Basal lip* produced. *Columella* vertical, straight and high, not twisted, slightly expanded, leaving sometimes a narrow umbilical chink. *Parietal wall* with a very thin callous layer.

Diameter, 10–15 mm.; height, 10–15 mm.

Animal unknown.

Type in the Mus. Hist. Nat., Geneva.

Hab.—North and South Islands, but more common in the North; Chatham Islands; coast of Taranaki (Dieffenbach); Auckland Harbour (Cheeseman); Mokohinau Islands; Ahipara Beach; Banks Peninsula (Iredale).

4. Janthina globosa, Swainson, 1822. Plate 44, fig. 13.

Janthina globosa, Swains., Zool. Illustr., ii, 1822, pl. 85; Conch. Icon., xi, pl. 4, f. 18; Man. Conch. (1), ix, 37, pl. 10, f. 12. *J. nitens*, Menke, Synopsis, 1828, 84; Man. Conch., *l.c.*, f. 11. *J. iricolor*, Reeve, Conch. Icon., xi, 1858, f. 23; M.N.Z.M., 71; Man. Conch., *l.c.*, f. 14.

Shell globose, very thin and fragile, plicately striated, polished. *Sculpture* consisting of oblique growth-striæ and plications, sharply situated below the middle of the last whorl, where there appear a few fine spiral lines; base with a few distant spiral incisions. *Colour* light violaceous, whitish below the suture, but darker on the base. *Spire* short, slightly immersed; outlines convex. *Protoconch* minute, pupiform. *Whorls* about 7, first slowly then rapidly increasing, convex, indistinctly biangulate; base convex. *Suture* deep. *Aperture* large, oval, higher than broad, produced into a short open channel at the base, rounded above. *Outer lip* regularly convex, with an angular not very deep sinus. *Columella* vertical, very little twisted, terminating in a point below. *Inner lip* very little expanded beyond the columella, forming a thin callus on the parietal wall.

Diameter, 38 mm.; height, 41 mm. (large specimen).

Animal unknown.

Hab.—North Island, not common.

Fam. CYPRÆIDÆ, Fleming.

Animal having a short proboscis, the tentacles usually long and stout, the eyes situate on a thickened portion about one-third the distance from the base; pallial aperture provided with a short anterior siphon; mantle produced into two lobes capable of covering the shell, and furnished with warts, or forked or pointed filaments, sometimes papillose, as in *Trivia*. Anus posterior; foot broad; osphradium with three lobes. The animals are hermaphrodite, with a very large copulatory organ. Radula rather long, with 7 series of teeth, arranged

2+1+1+1+2; the central and lateral teeth tricuspidate or multicuspidate; the marginals very variable, hooked, simple or denticulate. Jaws corneous. No operculum.

Shell ovate, varying from cylindrical to pyriform, sometimes ribbed or pustulate, but mostly smooth, and possessing a high polish and brilliant colouring; spire nearly, if not entirely, covered by the body-whorl, which envelops it; aperture nearly central, narrow, and longitudinal; lip and columella more or less toothed the entire length; occasionally, but rarely, without teeth.

Genus 1. Trivia. Sowerby and Gray, 1832.

Trivia, S. & G., Conch. Illustr. & Descr. Cat. Shells, by Sowerby, jun., and Gray, 1832, 13. Type: *Cypræa europæa*, Montagu.

Animal with the mantle-lobes approaching on the back of the shell; the ocular pedicels short. Radula with the central tooth multicuspidate, with a simple base; lateral teeth arcuate, with a denticulate margin; marginal teeth narrow, simple, slightly arcuate.

Shell usually small, transversely ridged, and frequently marked by a depression running antero-posteriorly across the dorsal region; whorls of the spire submerged, but may often be traced through their thin outside covering; anterior channel not prolonged, wide, and slightly reverted; front of columella internally concave, ribbed.

Distribution.—Warm and temperate seas.

Fossil.—Tertiary.

1. **Trivia australis,** Lamarck, 1822. Plate 46, figs. 3, 3*a*.

Cypræa australis, Lam., A.s.V., vii, 1822, 404. *Trivia australis*, Lam., Voy. Astrol., iii, 48, pl. 48, f. 19–26; Conch. Icon., Cypræa, iii, pl. 24, f. 138; Chenu, Man. Conch., i, 270, f. 1734; Thes. Conch., iv, 45, pl. 325, f. 439, 440; Man. Conch. (1), vii, 206, pl. 23, f. 53, 54; Chall. Rep., xv, 427. *Cypræa rosea*, Duclos: Potiez, Gall. des Moll., 1838, 477.

Shell small, ovate, slightly narrowed in front, rather thin, with a few brown spots on the back. *Sculpture* consisting of fine transverse costæ, interrupted on the dorsal surface by an impressed median line, more prominent near the aperture, and continued over the outer lip and the columella. *Colour* pinkish-white, with a few brown spots of various size on the back, the extremities tinted with rose, base white. *Protoconch* minute, usually hidden, but visible through the thin covering, of 2 narrowly-coiled-up smooth and convex whorls. *Aperture* narrow, curved at both extremities. *Outer lip* rounded, elevated beyond the apex, denticulated. *Columella* flattened, deeply excavated in front.

Diameter, 10 mm.; length, 14 mm.

Animal figured in Voy. Astrol.

Type in the Mus. Hist. Nat., Geneva.

Hab.—Cape Maria van Diemen; Whangarei Heads (C. Cooper); Hauraki Gulf; Chatham Islands; Te Mahia Peninsula; Cook Strait. More common in Australia and Tasmania.

Fossil in the Post-Pliocene of Victoria.

Remarks.—T. W. Kirk mentions a *T. zealandica* from the Tertiary beds near Petane, but in the very short diagnosis I fail to find anything that would separate his species from *T. australis*. Many Recent specimens have the transverse striæ passing only a short way up the sides of the shell.

Fam. **SEPTIDÆ**, Dall.

Tritonidæ, Broderip.

Animal having a short foot, broad and truncated anteriorly, tentacles subulate, with the eyes at their outer sides or bases; siphon short. Jaw reticulated. Radula with the central tooth large, multicuspidate; lateral tooth with a denticulated margin; marginals falciform, pointed, the inner ones usually with traces of denticulation.

Shell solid, with an epidermis and continuous or irregularly disposed varices; protoconch smooth, paucispiral, subglobose, nucleus not very prominent; aperture oval, often excavated above by a deep channel; canal of variable length, not closed, and but rarely sinuate at the base; outer lip thickened exteriorly, denticulate inside, mostly vertical; columella generally plicated, twisted with the canal. Operculum horny, with an apical or submarginal nucleus.

The animals of this family are generally brilliantly coloured, and they possess a purple gland secreting a coloured liquid. The period of rest is marked upon the shell by a varix.

Key to Genera.

A. Varices of shell not diametral—*i.e.*, directly opposed.
  a. Aperture without a channel at the suture.
    b. Canal short and truncated .. .. .. Septa.
    bb. Canal long and straight .. .. .. Cymatium.
B. Varices diametral, no sutural channel .. .. .. Argobuccinum.

Genus 1. Septa, Perry, 1811.

Septa, Perry, "Conchology, or the Natural History of Shells," 1811. Type: *Murex tritonis*, L. *Tritonium*, Bolten, 1798, and authors; not of O. F. Müller, 1776. *Triton*, Montfort, 1810; not of Linné, 1768 (Crust.). *Eutritonium*, Cossmann, 1904.

Animal having the foot truncated in front, large and rounded posteriorly; tentacles long, cylindrical, eyes on tubercles at their bases. Copulatory organ large, recurved. Central tooth of radula short, transverse, with numerous denticles.

Shell mostly large; spire elongated, with angular whorls, excavated above; protoconch lisse, subglobose; last whorl gibbous, with a strong axial varix, at about 120° from the labial varix; base convex, excavated around the canal; aperture oval, contracted and channelled above, narrowed below, and produced into a generally

short and truncated canal; outer lip vertical, with an external varix, thickened and crenated or denticulated internally; columella excavated, slightly twisted below, inflected with the canal, surface rough or smooth, with a parietal tooth bordering the posterior channel. Operculum ovate, its growth annular either from a subapical or submarginal nucleus.

The *Tritons* are distinctly tropical in distribution, no species inhabiting the colder seas. Fossil they appear first in the Cretaceous, and numerous species occur in the Tertiary.

A number of species have a world-wide distribution, which is doubtless due to their free-swimming or pelagic larvæ. These are very different at first from the adult both in animal and shell, undergoing a metamorphosis at a period subsequent to hatching.

Vernacular Name.—Triton-shell.

KEY TO SPECIES.

a. Shell with one varix only .. .. *costata*.
aa. Shell with more than one varix.
b. Spiral ribs broad, smooth, only those close to the suture nodulous; interstices narrow .. .. .. *tritonis*.
bb. Two spiral strongly nodulous ribs; interstices broad, with fine spiral threads .. .. *rubicunda*.

1. **Septa rubicunda**, Perry, 1811. Plate 1, fig. 3; Plate 43, fig. 1.

Septa rubicunda, Perry, "Conchology," 1811, pl. 14, f. 4. *Triton nodifer*, Lam., A.s.V., vii, 1822, 179. *T. nodiferus*, Lam., Man. Conch. (1), iii, 10, pl. 1, f. 2, 3; Conch. Icon., ii, pl. 3, f. 9. *T. australe*, Lam.: Hutton, C.M.M., 13; M.N.Z.M., 63, not of Lamarck. *Lotorium rubicundum*, Perry, Index, 75; Kesteven, P.L.S. N.S.W., 1902, 464, f. 2 in text (protoconch).

Shell large, fusiform, varices in the same direction on alternate whorls, with nodular spiral ridges, whorls shouldered. *Sculpture* consisting of strongly nodular spiral ribs, 2 on the spire-whorls, 8 prominent spirals on the body-whorl, and numerous finer and closer ones on the lower half of the base; shoulder with a number of close or distant subsequently strong spiral ridges, very little nodulous; interstices between the strong spiral ribs finely spirally striate; varices rounded on the spire-whorls, elevated and sharp on the body-whorl. *Colour* yellowish-brown, variegated with dark brown and white on the cinguli; aperture white, teeth of the outer lip reddish-brown, inner lip light brown, the plications white. *Spire* high, conical, usually higher than the aperture. *Protoconch* of $3\frac{1}{2}$ whorls, semitransparent, delicate pink, smooth, shining. *Whorls* about 10, distinctly shouldered, with a nodular keel; base convex, concave around the base of the neck. *Suture* deep, uneven, and wavy. *Aperture* oblique, ovate, distinctly channelled above, with a short, open, and somewhat recurved canal below. *Outer lip* expanded, sharp, denticulate, with an outer varix, inside with long and strong teeth, sometimes arranged in groups

of 2 or 3. *Columella* subvertical, faintly concave above, convex below. *Inner lip* produced far beyond the columella as a free plate, narrowed to a point below; spreading as a thin polished glaze widely upon the body-whorl, with a prominent fold above, usually 2 smaller ones below it; columellar border with numerous folds, stronger and more raised below. Sometimes an *umbilical chink* is present. *Operculum* thick, horny, dark brown, concentrically lamellate, nucleus apical.

Diameter, 9·5 cm.; height, 20 cm. (large specimen).

Dentition.—Troschel, Das Gebiss d. Schnecken, pl. 19, f. 11 *a*, *b*; Man. Conch. (1), iii, pl. 2, f. 5; Atlas, pl. 1, f. 3.

Hab.—North Island, as far as Napier and Kawhia; Chatham Islands. Mediterranean, Atlantic coast of Europe, British Channel, Canaries, Japan, Australasia.

2. **Septa tritonis,** Linnæus, 1758. Plate 42, fig. 1.

Murex tritonis, L., Syst. Nat., ed. x, 754. *Tritonium tritonis*, L., Ad. G.R.M., pl. 11, f. 1c. *Triton tritonis*, L., Man. Conch. (1), iii, 9, pl. 1, f. 1; pl. 3, f. 16; pl. 5, f. 25. *T. variegatum*, Lamarck, A.s.V., vii, 1822, 178; Conch. Icon., ii, pl. 2, f. 3, 6. *Lotorium tritonis*, L., Index, 75.

Shell very large, fusiform, solid, with broad flat spiral ribs, yellowish, variegated with brown. *Sculpture* consisting of broad flatly convex spiral ribs, about twice as broad as the interstices, which are ornamented with 1 or several smaller cinguli; the whorls are usually slightly shouldered, and the shoulder bears 4 narrow rounded spiral ribs, slightly nodulous, the uppermost broader than the others, and margining the suture; on the earlier whorls the spiral riblets, 3 to 4 on a whorl, are narrow, distant, and distinctly nodular. The varices descend in the same direction on alternate whorls; they are thick and rounded on the upper whorls, sharp and foliaceous on the last two whorls. *Colour* whitish or yellowish, variegated with semilunar markings of dark brown arranged in axial rows; inside of aperture deep orange, with double revolving reddish-brown bands; the columella banded with white and dark brown. *Spire* elevated, conic, mostly somewhat higher than the aperture. *Protoconch* lost in most specimens, very likely of a few smooth convex whorls. *Whorls* about 9–12, the last very large, depressed convex; base rounded, concave above the short canal. *Suture* impressed, uneven, wavy. *Aperture* very large, slightly oblique, ovated, channelled above, produced below into an open, broad and short, recurved canal. *Outer lip* expanded, sharp, denticulated at the margin, each denticle ending a double revolving brown band. *Columella* vertical, arcuate. *Inner lip* extending beyond the columella as a free plate, forming a deep false umbilicus above and a deep oval fissure below; the lip is spreading over the parietal wall, and is crossed throughout by numerous irregular white wrinkles or plaits.

Diameter, 18 cm.; height, 38 cm. Angle of spire, 40°.

Dentition.—Troschel, Das Gebiss d. Schnecken, pl. 19, f. 12, *a*, *b*, *c*; Man. Conch. (1), iii, pl. 2, f. 4.

Hab.—Cape Maria van Diemen (Dr. Dieffenbach); Ahipara Bay, thrown up after gales. Indo-Pacific and Atlantic regions.

Subgen. 1. LAMPUSIA, Schumacher, 1817.

Lampusia, Schumacher, Essai d'un Nouv. Syst., &c., 1817, 250. Type: *Murex pilearis*, L. *Simpulum*, Klein, 1753, in Mörch, 1852; not of Fabricius, 1822.

Shell fusiform, large and solid, nodosely ribbed; aperture ovate, more or less distinctly channelled above, with a somewhat elongated canal; outer lip thick, varicose, plicate-dentate within; inner lip plicate. Operculum with apical nucleus.

3. **Septa costata**, Born, 1778. Plate 43, fig. 2.

Murex costatus, Born, Test. Mus. Cæs. Vindob., 1778, 295. *M. olearium*, L., Syst. Nat., ed. xii, 1767; not of Linné, 1758. *Tritonium olearium*, L., M.N.Z.M., 64. *Triton olearium*, L., Conch. Icon., ii, pl. 10, f. 32; Man. Conch. (1), iii, 11, pl. 3, f. 19; pl. 4, f. 24; pl. 5, f. 27–29; pl. 6, f. 37. *Lotorium olearium*, L., Index, 75. *Triton olearium*, L., 1767: Watson, J.L.S., xxvi, 321; Kesteven, P.L.S. N.S.W., 1901, 712, pl. 35, f. 4, 5 (protoconch). *Murex parthenopus*, von Salis, 1790. *Triton succinctum*, Lamarck, A.s.V., vii, 181. *T.* (*Simpulum*) *acclivis*, Hutton, C.M.M., 13, plate fig. 8. *T.* (*Simpulum*) *costatus*, Born: Watson, Chall. Rep., xv, 390.

Shell moderately large, solid, broadly fusiform, with strong revolving ribs. *Sculpture* consisting of strong nodulous spiral ribs, 2 on the spire-whorls and about 14 on the body-whorl, very frequently partially separated into approximate pairs by an incised line; sometimes they are partially broken up into revolving series of granules; there are 2 or 3 fine cinguli on the shoulder, and usually 1 between the strong ribs; on the body-whorl only 6 are stout, the remainder, upon the neck, low and narrow; there is only 1, not much elevated, varix on the body-whorl, to the left of the aperture. *Colour* light brown, the varix and lip usually tessellated with dark brown, the columella frequently of the same colour between the whitish plications. *Epidermis* present in fresh shells; it is thin, horny, developing at frequent intervals into longitudinal reflexed ridges, produced into long hair-like digitations. *Spire* more or less elevated, conic; outlines convex. *Protoconch* attenuately conical, corneous, of 6 microscopically reticulate whorls, separated from the succeeding whorls by a slight varix. *Whorls* 9 to 10, the last rather large, distinctly shouldered, slightly convex; base flattish, depressed above the neck. *Suture* impressed, uneven. *Aperture* oblique, oval, with a distinct channel above, and a short, open, somewhat recurved canal below. *Outer lip* thick, with a strong nodulous varix on the outside, deeply grooved on the inside. *Columella* subvertical, almost straight, inflexed towards the canal. *Inner lip* extending over the parietal wall and the

columella down to the canal, where it ends in a narrow and pointed lamella, leaving a narrow chink at the base. The *parietal wall* is sculptured by the continuation of the spiral ribs, the columella with oblique narrow plaits and wrinkles. *Operculum* with terminal nucleus.

Diameter, 5·3 cm. ; height, 9 cm. Angle of spire, 70°.

Type in the K.K. Hofmuseum, Vienna.

Hab.—Northern parts of New Zealand : Hauraki Gulf ; Bay of Islands.

The species is widely distributed. From the Mediterranean and the West Indies by Africa and Brazil to the Cape of Good Hope, Australia and New Zealand, Japan and Society Islands.

Fossil from the Upper Miocene beds of Calabria onwards. Not known fossil from New Zealand.

Genus 2. Cymatium, Bolten, 1798.

Cymatium, Bolten, Mus. Bolten. (2), 1798, 129. Type : *Murex femorale*, L.
Lotorium, Montfort, 1810.

Shell with triangular whorls, which are coronated ; aperture mostly longer than the spire, the canal rather long and generally straight ; outer lip dentated internally. Operculum with apical nucleus.

Distribution.—Similar to that of *Septa*.

Key to Species.

A. Shell large, height more than 5 cm. ; body-whorl with 8 to 10 cinguli .. .. *Spengleri.*
B. Shell rather small, height less than 5 cm.
a. Spire about the height of the aperture ; body-whorl with 5 strong prominent cinguli ; canal straight .. *exaratum.*
aa. Spire higher than the aperture ; body-whorl with 4 low and narrow spirals ; canal oblique and recurved .. *Parkinsonianum.*

1. Cymatium exaratum, Reeve, 1844. Plate 44, fig. 14.

Triton exaratus, Rve., P.Z.S., 1844, 116 ; Conch. Icon., ii, pl. 13, f. 50 ; Man. Conch. (1), iii, 22, pl. 12, f. 102, 104. *Lotorium cornutum*, Perry, Index, 75 ; Hedley, P.L.S. N.S.W., 1902, 26, not of Perry ; Kesteven, P.L.S. N.S.W., 1902, 460, pl. 17, f. 10 (protoconch).

Shell rather small, whorls flat-shouldered, canal moderately long. *Sculpture* consisting of 2 prominent cinguli on the spire-whorls at and below the shoulder, with a fine spiral thread in the groove, crossed by distant radiate ribs, about 8 on a whorl, the points of intersection raised into rounded nodules ; shoulder with 3 fine spiral threads ; body-whorl with 5 prominent cinguli, and a number of smaller ones upon the neck ; there are 2 high and rounded varices. *Colour* whitish, variegated or banded with brown, or brown with a white median band ; aperture white. *Epidermis* thin, horny, spirally striated. *Spire* conoidal, gradate, about the same height as the aperture. *Protoconch* of $4\frac{1}{2}$ whorls, semitransparent, smooth. *Whorls* about 9, slowly

increasing, strongly keeled and flatly shouldered; base excavated around the neck. *Suture* deep. *Aperture* slightly oblique, indistinctly channelled above, produced below into a moderately long, straight, and open canal. *Outer lip* with a strong outer varix, inside denticulate and distantly lirate. *Columella* vertical, nearly straight, wrinkled. *Inner lip* spreading as a thin white callus over the parietal wall and the columella, narrowly drawn out towards the margin of the canal.

Diameter, 26 mm.; height, 45 mm.

Animal unknown.

Type in the British Museum.

Hab.—Tauranga.

The type is from Australia.

2. Cymatium Parkinsonianum, Perry, 1811. Plate 44, fig. 15.

Septa Parkinsoniana, Perry, "Conchology," 1811, pl. 14, f. 1; Hedley, P.L.S. N.S.W., 1902, 26. *Triton fusiformis*, Kiener, Icon. Coq. viv., vii, 1842, 36, pl. 5, f. 2; Man. Conch. (1), iii, 11, pl. 4, f. 2. *Lotorium Parkinsonianum*, Perry: Kesteven, *t.c.*, 464 (description of protoconch).

Shell small, solid, shouldered, nodulosely costate and spirally lirate. *Sculpture:* The whole shell, except the protoconch, finely spirally striate; on the last whorl there are 2 distant and more prominent striæ crossing the nodules upon the angle, and 2 upon the base, all being minutely granulose; the liræ on the neck of the canal are alternately finer and stouter; axial sculpture consisting of strong, rounded varices, almost in the same direction on alternate whorls; between the varices are 4 to 6 large, elongate, rounded knobs. *Colour* yellowish-brown, the spiral striæ articulated with brown and white, protoconch with brown radiate lines; aperture white within. *Epidermis* thin, horny, yellowish-green, with short bristles upon the granules. *Spire* elevated conic, a little higher than the aperture (canal excluded); outlines straight. *Protoconch* of $3\frac{1}{2}$ whorls, smooth, convex, the nucleus very minute. *Whorls* 8 to 9, first rather slowly increasing, with a high shoulder; base moderately concave. *Suture* impressed, undulating. *Aperture* a little oblique, ovate, angled above, produced below into a moderately long and narrowly open canal, which is turned a little to the left and curved backward. *Outer lip* strongly varicose, with a groove inside under the varix, margin sharp. *Columella* vertical, arcuate, narrowed to a point below. *Inner lip* thin, rather broadly expanded, and extending over the parietal wall, which has a minute plait below the angle of the aperture.

Diameter, 12·5 mm.; height, 22 mm. (specimen from the Bay of Islands). Specimens from Port Jackson, Australia, measure 21·5 mm. by 36 mm.

Animal unknown.

Hab.—Bay of Islands, one empty shell (J. C. Anderson); Kermadec Islands (Captain Bollons).

Remarks.—The shell found by Mr. Anderson is in fairly good condition, though minus the protoconch. It is much smaller than Australian specimens I have seen. Considering the wide distribution of some species of *Septa* and *Cymatium*, and the smallness of this species, I do not think it to be too hazardous to claim it for our fauna. It may, of course, be an occasionally dropped shell, but the rather good preservation of the specimen seems to tell against this, as also its occurrence at the Kermadecs.

3. **Cymatium Spengleri,** Chemnitz, 1795. Plate 43, fig. 3.

Murex Spengleri, Chemn., Conch. Cab., xi, 1795, 117, pl. 141, f. 1839–40. *Triton Spengleri*, Voy. Astrol., ii, 538, pl. 40, f. 1, 2; Conch. Icon., ii, pl. 11, f. 36; Man. Conch. (1), iii, 16, pl. 9, f. 61; Chall. Rep., xv, 393. *Tritonium Barthelemyi*, Bernardi, J. de Conch., vi, 54, pl. 1, f. 1. *Triton Waterhousei*, Adams and Angas, P.Z.S., 1864, 35; Küster, Conch. Cab., iii, 257, pl. 69, f. 1, 2. *T. Strangei*, Ad. & Ang., P.Z.S., 1878, pl. 15, f. 16. *Lotorium Spengleri*, Chemn.: Pritchard and Gatliff, P.R.S. Vic., x (n.s.), 263; Kesteven, P.L.S. N.S.W., 1901, 713, pl. 36, f. 8, 9; *l.c.*, 1902, 462, pl. 17, f. 19 (protoconch); Hedley, P.L.S. N.S.W., 1904, 193, pl. 8, f. 19 (eggs).

Shell large, thick and ponderous, fusiform, spirally costate and radially finely ribbed, with shouldered whorls, perforate. *Sculpture* consisting of large sulcated spiral carinæ, which are distinctly and regularly nodose, the whole ornament passing over the much elevated, compressed varices; large and small carinæ alternating; shoulder with a few incised revolving lines; the whole sculpture crossed by numerous, subequidistant, broadly rounded axial riblets, interrupted by the spiral narrow grooves. *Colour* yellowish-brown, the incised revolving lines chestnut-brown; aperture white. *Epidermis* thin, horny, spirally regularly striate, with short bristles. *Spire* elevated conical, about the same height as the aperture; outlines almost straight. *Protoconch* of 4½ horny, translucent, and very finely reticulated whorls, slightly oblique to the vertical axis. *Whorls* 10 to 11, first slowly then more rapidly increasing, with an oblique flat shoulder; base flattish. *Suture* deep, undulating. *Aperture* oblique, oval, with a distinct channel above, produced below into a short, open, somewhat recurved canal. *Outer lip* much expanded, rather sharp, very prominently denticulated by the spiral carinæ, deeply lirate inside, sometimes with a radial row of tubercles, the elevated spirals with a broad median sulcus. *Columella* vertical, straight above, convex below. *Inner lip* spreading as a thin white and polished callus a little beyond the columella, leaving the elevations of the cinguli still visible, and reaching across the parietal wall to the outer lip; a small rounded tooth above; towards the base the lip is drawn out to a point on reaching the inner margin of the canal, leaving a more or less open umbilical perforation. *Operculum* concentrically lamellate, nucleus subapical.

Diameter, 8 cm.; height, 13 cm.: angle of spire, 40°. Diameter, 5 cm.; height, 9 cm.

Dentition unknown.

Hab.—Throughout New Zealand; Chatham Islands; Kermadec Islands: on rocky ledges near and below low-water mark. Australia and Tasmania.

Fossil in the Miocene and Pliocene.

Genus 3. Argobuccinum, Herrmansen, 1846.

Argobuccinum, Herrmansen, Index Gener. Malac., 1846. Type: *Murex argus*, Gmel. *Bufo*, Montfort, 1810; not of Laurenti, 1768.

Shell of medium size, spire short and conic, with spiral cords and more or less distinct axial ribs, sometimes with a nodulous angle on the whorl; varices continuous or subcontinuous; aperture rounded, without a posterior sutural channel; canal short, recurved; outer lip with an external varix, plicated inside. Columella but little excavated above, distinctly ridged.

Key to Species.

A. Shell oval, whorls convex, spirally subnodulosely striated, varices flattened	*argus.*
B. Shell fusiform, whorls shouldered, with a strongly nodose carina, varices elevated and rounded	*australasia.*

1. Argobuccinum argus, Gmelin, 1790. Plate 43, fig. 4.

Murex argus, Gmel., Syst. Nat., ed. xiii, 3547. *Ranella argus*, Gmel.; Lamarck, A.s.V., vii, 151. *Triton ranelliformis*, King, Zool. Journ., v, 1832, 347. *Ranella vexillum*, Sowerby, Conch. illustr., 1841, pl. 1, f. 3; P.Z.S., 1843, 51. *R. Kingii*, d'Orbigny, Voy. Amér. mérid., v, 1841, 451. *Bursa* (*Apollon*) *proditor*, Frauenfeld, "Novara" Moll., 1867, 4, pl. 1, f. 1. *Ranella argus*, Gmel., Man. Conch. (1), iii, 44, pl. 24, f. 61–65. *Apollo argus*, Gmel., Index, 75. *Bursa tumida*, Dunker, Nov. Conch.

Shell ovate, solid, slightly nodulous, varices subcontinuous. *Sculpture* consisting of fine and close spiral striæ; on the spire-whorls there are 4 more prominent spiral ridges, crossed by slightly oblique and numerous radiate riblets, the crossing-points raised into small tubercles; on the last whorl there are indistinct broad spiral ribs, the whole surface finely spirally striate, and the axial ribs are almost obsolete. *Colour:* The spiral ridges are reddish-brown, the interspaces whitish, sometimes with a brown median thread. *Epidermis* thin, olivaceous, closely wrinkled, velvety. *Spire* rather short, conic, about the same height as the aperture. *Protoconch* small, conical, mostly much corroded. *Whorls* 8 to 9, the last large, convex; the varices subcontinuous, flat, inconspicuous; base slightly excavated at the neck. *Suture* not deep. *Aperture* oblique, ovate, channelled above by the teeth of the outer lip, and a strong thick and broad tooth on the parietal wall; canal short, widely open, slightly recurved. *Outer lip* expanded, sharp, denticulate towards the base, grooved inside, and with a row of paired teeth. *Columella* vertical, somewhat

concave, bent to the left on reaching the canal. *Inner lip* broad, extending far beyond the columella, with a sharp and free edge, narrowed to a point below, and spread thinly over the parietal wall. *Operculum* light brown, horny, obliquely striate, nucleus apical.

Diameter, 62 mm. ; height, 103 mm Angle of spire, 62°.

Dentition.—Troschel, Das Gebiss d. Schnecken, pl. 20, f. 11 ; Man. Conch. (1), iii, pl. 2, f. 12.

Hab.—Throughout New Zealand and at the Chatham Islands, usually in 10 to 20 fathoms ; Auckland Islands.

The type is from the Cape of Good Hope. The species has been recorded from Tasmania, Australia, St. Paul and Amsterdam, Tristan da Cunha Islands, Natal, Cape Colony, and Chile.

The description is drawn up from New Zealand specimens.

Remarks.—Von Martens is inclined to take *R. argus* and *R. vexillum* as distinct species (Deutsche Tiefsee Exped., Gastropoden, 1903, p. 41). Its distribution is similar to that of *Phalium pyrum ;* but its presence in the Antarctic region, and the palæontological facts, prove that it has been spreading towards the Antarctic from the Cape of Good Hope. (Von Ihering.)

2. Argobuccinum australasia, Perry, 1811. Plate 43, fig. 5.

Biplex australasia, Perry, "Conchology," 1811, pl. 4, f. 2, 4. *Ranella leucostoma*, Lamarck, A.s.V., vii, 1822, 150. *Triton leucostomum*, Q. & G., Voy. Astrol., ii, 546, pl. 40, f. 3–5. *Ranella leucostoma*, Lam., Conch. Icon., ii, pl. 1, f. 4. *R.* (*Argobuccinum*) *leucostoma*, Lam. : Watson, Chall. Rep., xv, 401. *Lotorium* (*Argobuccinum*) *leucostoma*, Lam. : Pritchard and Gatliff, P.R.S. Vic., x (n.s.), 268. *Gyrineum australasia*, Perry : Kesteven, P.L.S. N.S.W., 1901, 713, pl. 36, f. 1 (protoconch). *Apollo australasia*, Perry, Index, 75. *Biplex australasia*, Perry = *Ranella leucostoma*, Lam. : Hedley, P.L.S. N.S.W., 1902, 26. *Ranella leucostoma*, Lam., Man. Conch. (1), iii, 42, pl. 23, f. 53, 54.

Shell of medium size, fusiform, shouldered, with a nodulous keel, varices subdiscontinuous. *Sculpture* consisting of subequal spiral threads, with finer ones in the interspaces, crossed by very close and fine growth-lines ; carina of the shoulder, and usually 1 or 2 cinguli towards the base, ornamented with strong rounded nodules, 5 to 6 between the varices, which are not quite continuous, elevated and rounded. *Colour* reddish-brown, varices banded with white and dark brown; the margin below the suture and the nodulous cinguli are of darker colour ; aperture white. *Epidermis* olive, velvety. *Spire* elevated conical, gradate, but little higher than the aperture ; outlines straight. *Protoconch* of about 5 smooth and convex whorls. *Whorls* 10 to 11, first rather slowly increasing, the sloping shoulder moderately concave, straight below the carina ; base flattish. *Suture* impressed, uneven, and wavy. *Aperture* slightly oblique, ovate, with an inner channel above, produced into a short open and slightly recurved canal below. *Outer lip* with a thick varix on the outside, inside with 2 rows of rounded teeth, separated by a groove which

corresponds with the elevation of the varix. *Columella* vertical, very little concave. *Inner lip* spreading beyond it, smooth, narrowed below, and with numerous wrinkles on the inner edge of the canal; extending over the parietal wall, with a prominent tooth above. *Operculum* oval, nucleus apical.

Diameter, 42 mm.; height, 74 mm. Angle of spire, 50°.

Animal with a yellowish, finely velvety epidermis. Head large; tentacles long, cylindrical, distant, with the eyes prominent and near their bases. Foot large, quadrilateral, yellowish, and grooved in front. Muzzle cylindrical. Radula rather long, with 5 rows of teeth. There are 2 salivary glands. The male with a long and grooved intromittant organ. (Quoy and Gaimard.)

Hab.—North Island, and Martin's Bay in the South Island; Bream Bay (Q. & G.); Cook Strait (Dr. Dieffenbach); Whangarei Heads (C. Cooper); Kermadec Islands (T. F. Cheeseman).

Fam. **CASSIDIDÆ**, Adams.

Animal with large head, eyes at the exterior base of the tentacles; proboscis cylindrical, extensible; mantle and foot large; siphon moderately long. Jaws reticulated. Central tooth of radula with several cusps, the median larger; lateral teeth large, multicuspidate; marginals falciform, simple or denticulate.

Shell solid, subglobular or triangular, with short spire; whorls sometimes varicose; aperture terminating anteriorly in a short recurved canal; columella callous, spread out, usually plicate; outer-lip margin thickened, dentate within. Operculum corneous, concentric, elongated, semilunar, the nucleus at the centre of the inner margin.

The varices of the shell persist in its interior.

These animals are active and voracious, living in sandy localities, and preying on bivalve molluscs.

Genus 1. PHALIUM, Link, 1807.

Phalium, Link, Beschr. Rostock Samml., 1807, 112. Type: *Cassis glauca*, L. *Cassidea*, Perry, 1811. *Bezoardica* α, Schumacher, 1817. *Cassis*, Bowdich, 1822. *Semicassis*, H. and A. Adams, 1853. *Casmaria*, Fischer, 1844.

Animal having an oval foot, extending beyond the shell, with a marginal groove and a small inferior aquiferous pore; copulatory organ flattened, ending in a fleshy, hook-shaped appendix, and being grooved the whole length.

Shell usually rather solid and thick, with the last whorl very large, often varicose; aperture longitudinal, narrow; outer lip with a thickened reflected margin, and dentate within; inner lip rugosely plicate.

About twenty-five species are known, inhabiting warm seas.

Fossil in the Tertiary.

Vernacular Name.—Helmet-shell.

Subgen. 1. Cassidea (Bruguière), Swainson, 1840.

Cassidea, Bruguière, Encycl. Méth., i, 1789, p. xv; 1792, 414: Swainson, Malac., 1840, 299. Type: *Cassis vibex*, L. *Casmaria* (in part), H. and A. Adams, 1853. *Cassidea*, Swains.: W. H. Dall, U.S. Geol. Survey., Professional Paper 59—"The Miocene of Astoria and Coos Bay, Oregon," 1909, 61.

Shell ovate, smooth, polished, with only a terminal varix; body-callus smooth and adherent throughout.

1. Phalium labiatum, Perry, 1811. Plate 40, fig. 12.

Cassidea labiata, Perry, "Conchology," 1811, pl. 34, f. 1. *Cassis achatina*, Lamarck, 1822; Conch. Icon., v, pl. 10, f. 28*a*; Man. Conch. (1), vii, 278, pl. 8, f. 94.

Shell of moderate size, ovato-acute, ventricose, smooth, subperforate, polished. *Sculpture:* Quite smooth or ornamented with 1 spiral series of nodules. *Colour* light brown or cinereous, longitudinally flamed with dark chestnut, often with narrow spiral bands of chestnut and white articulations; mouth pale purple; outer lip white, banded with brown. *Spire* not high, conical, a little more than one-third the height of the aperture; outlines slightly convex. *Protoconch* small, obtuse, of 1½ smooth whorls. *Whorls* 6, first very slowly then more rapidly increasing, flatly convex; base convex. *Suture* deep. *Aperture* subvertical, moderate, pyriform, narrowly channelled above, with a very short, deep, open canal at the base, which is sharply curved. *Outer lip* thick, with a sharp edge on the outside, inside rounded, smooth, subdenticulate towards the base. *Columella* subvertical, thick and rounded, with a few small folds, a groove, followed by an elevated ridge below. *Inner lip* spreading as a thick polished callosity far beyond the columella, bearing a few indistinct folds, and leaving only a narrow umbilical chink; the basal lip is continued from the canal in the groove behind the neck, and enters the umbilicus as a narrow sharp ridge; the inner lip forms a very thin callosity on the parietal wall below, but is getting thick and prominent on the outside on approaching the outer lip. *Operculum* as described for the family.

Diameter, 40 mm.; height, 60 mm. Angle of spire, 85°.

Animal unknown (?).

Type of *C. achatina* in the Mus. Hist. Nat., Geneva.

Hab.—Northern parts of New Zealand, rare; Omaha; Whangarei Heads (C. Cooper); Kermadec Islands (Captain Bollons). Australia, Cape of Good Hope, &c.

Subsp. pyrum, Lamarck, 1822. Plate 40, fig. 13.

Cassis pyrum, Lam., A.s.V., vii, 1822, 226; Man. Conch. (1), vii, 278, pl. 8, f. 96–98; Conch. Icon., v, pl. 11, f. 29. *C. nivea*, Brazier, P.Z.S., 1872. 616, pl. 44, f. 1. *C. striatus*, Hutton, C. Tert. M., 8. *C. tumida*, Petterd, P.R.S. Tas., 1885, 321.

Shell moderately large, ventricose, ovate, with more or less distinctly angled and nodulose whorls. *Sculpture* consisting of a row of

nodules upon the angle of the shoulder, sometimes with a second row a little further down, a number of cinguli between the angle and the suture; the upper whorls finely spirally striated; from 6 to 8 shallow grooves on the base; incremental lines distinct, reticulating the fine spiral striæ of the upper whorls: the prominence of the sculpture is subject to great variation. *Colour* uniformly bay or pale dun, with bands of chestnut-brown wavy spots; outer lip banded with purplish-brown upon the outer edge. *Spire* low, conoidal, sharply pointed, about one-fifth the height of the aperture. *Protoconch* small, globose, of $2\frac{1}{2}$ smooth and convex whorls. *Whorls* about 7, the last large and ventricose, angulate above, flatly convex below; base rounded. *Suture* impressed. *Aperture* large, indistinctly channelled above, with a sharply recurved short and open canal below. *Outer lip* rounded, quite smooth. *Columella* slightly oblique, with a number of small folds above, and 1 or 2 large plaits below. *Inner lip* spreading as a thick white and folded plate beyond the columella, leaving the triangular umbilicus wide open.

Diameter, 31 mm.; height, 42 mm.: angle of spire, 102°. Diameter, 60 mm.; height, 87 mm. (very large specimen).

Animal unknown.

Type in the Mus. Hist. Nat., Geneva.

Hab.—North Island, and Martin's Bay in the South Island; Hawke's Bay, in about 20 fathoms; Kermadec Islands. Found also in Australia and Tasmania, &c.

Remarks.—Distinguished from the species in being thinner, more inflated, with a shorter spire, more or less distinctly noduled, and spirally sulcate above and on the base.

This subspecies is of quite special interest. "I have found it on the coast of Rio Grande do Sul, and it is known from the Indian Ocean, New Zealand, meridional Africa, &c. It has been found fossil in the Pliocene of New Zealand. As no species of *Cassidea* has been found in the Tertiary of Argentina, it is evident that it is of tropic origin, adapting itself to the temperate zone in distant regions." (Von Ihering.)

Fossil in the Pliocene.

Fam. **TONNIDÆ.**

Animal very large; the mantle dilated; head wide, bearing 2 elongated distant tentacles, dilated at the base, and having eyes near the base; proboscis cylindrical, greatly developed, extensible and flexible; foot lobed and dilated in front, with a horizontal groove.

Shell thin, ventricose, ovate or subglobose, subumbilicate; spire short, the body-whorl very large, with revolving ribs or decussated; aperture large, situated at the base. No operculum in the adult.

The shells are mostly of large size, and the species are few in number, inhabiting warm seas.

Fossil.—A Cretaceous form is known, with some Tertiary species.

Genus 1. Tonna, Brünnich, 1772.

Tonna, Fund. Zool., 1772, 248. Type: *Buccinum galea*, L. *Cadus*, Bolten, 1798. *Dolium*, Lamarck, 1801.

Animal having the foot very large, truncated in front, attenuated behind; mantle not reflected over the shell; tentacles cylindrical, distant, eyes at their outer base on distinct pedicels; proboscis long, thick; siphon long; copulatory organ large, curved, with a longitudinal groove, ending in a fleshy hook. A jaw is present. Central tooth of radula with an elongated central and 2 shorter lateral cusps; lateral and marginal teeth sharp-pointed, simple.

Shell thin, ventricose, globosely oval; spire generally short, whorls with spiral depressed ribs; aperture very large, broadly sinuated at its base; outer lip crenulated, lirate within; columella twisted, with a fold corresponding with the basal fasciole, ending in a beak below.

Vernacular Name.—Tuns.

1. Tonna variegata, Lamarck, 1822. Plate 47.

Dolium variegatum, Lam., A.s.V., vii, 261; Dieff. N.Z., 234; Conch. Icon., v, pl. 5, f. 7; Man. Conch. (1), vii, 262, pl. 3, f. 13. *D. Kieneri*, Philippi, Abbild. neuer Conch., iii, 36 (*teste* Tryon).

Shell large, globose, spirally ribbed, umbilicate. *Sculpture* consisting of low rounded spiral ribs, 15 to 18 on the last whorl, the interstices nearly as wide, the upper ones bearing an intermediate smaller rib; the oblique growth-lines distinct and passing over the ribs. *Colour* whitish or yellowish-brown, maculated with brown on the ribs, often with one or two ribs more yellowish in colour, upon which there are no maculations *Epidermis* thin, horny, easily peeling off. *Spire* short, conoidal. *Protoconch* small, globose, of $2\frac{1}{4}$ smooth and convex whorls, covered by a thin horny epidermis. *Whorls* 7, first rather slowly increasing, convex, the last very large; base rounded, excavated above the fasciole. *Suture* excavated. *Aperture* large, oval, sinuated below. *Outer lip* flatly convex, sharp, crenulated by the spiral sculpture, lirate within. *Columella* vertical, slightly twisted, with a broad low plait above, produced by the descending fasciole, a few small plications further down. *Inner lip* spreading a little beyond the columella, but leaving the narrow umbilicus open.

Diameter, 102 mm.; height, 120 mm. (the height varies from 100 mm. to 230 mm.).

Animal unknown.

Type in the Mus. Hist. Nat., Geneva.

Hab.—From the North Cape to Tauranga; Cape Maria van Diemen (Dieffenbach); Whangarei Heads (C. Cooper); Great Barrier Island; Tauranga (Dominion Museum). Found also in Australia.

Remarks.—The animals live buried in muddy sand. In Australia the species has been found in depths from 22 to 66 fathoms. The

New Zealand specimens are smaller, and but rarely so much spotted as Australian shells.

In the Canterbury Museum there is a specimen of *T. costata* from the Bay of Islands. It is no doubt an accidentally dropped specimen, and does not belong to the New Zealand fauna.

Fam. ARCHITECTONICIDÆ, H. and A. Adams.

Solariidæ, Chenu. *Architectonidæ*, Gray.

Animal with very large oval foot, notched in front; tentacles cylindrical, split throughout their length, thick, with eyes sessile on swellings near their outer bases. Dentition variable.

Shell depressed conic, turbinate or planorbiform; aperture entire, angular or subcircular; lip and columella simple, interior without nacre; umbilicus wide and deep, and usually with crenulated margins; main sculpture usually spiral. Operculum corneous, spiral.

Key to Genera.

A. Shell depressed conic, angular at the periphery, umbilicus with strongly crenulated margin .. .. .. Architectonica.
B. Shell turbinate, umbilicus moderate or wide, rounded at the periphery, margin of umbilicus slightly crenulated; operculum elevated spiral .. .. .. Heliacus.
C. Shell subdiscoidal, flat or concave above, whorls carinated at the periphery, umbilicus keeled.. .. .. Omalaxis.

Genus 1. Architectonica, Bolten, 1798.

Architectonica, Bolten, Mus. Bolten. (2), 1798, 78. Type: *Trochus perspectivus*, L. *Solarium*, Lamarck, 1799.

Animal with a large foot, notched in front, and having a very pronounced marginal fold; head large, furnished with 2 tentacles, which are short, thick, and cylindrical; eyes on swellings near the outer bases of the tentacles; gill-cavity divided by a longitudinal fold.

Shell depressed, conic, angular at the periphery; aperture subquadrangular; lip simple; umbilicus with crenulated margins, spiral, wide, and perspective.

Distribution.—World-wide, inhabiting warm seas.

Fossil.—Tertiary.

Subgen. 1. Architectonica, s. str.

Solariorbis, Conrad, 1865.

Surface of the shell strongly and closely sculptured longitudinally, spirally ribbed and sulcate. Operculum corneous, paucispiral, with the nucleus subexcentric.

The teeth of the radula are long, spiniform, pronged, and without a central tooth. A jaw is present.

1. Architectonica Reevei, Hanley, 1862. Plate 44, fig. 16.

Solarium Reevei, Hanl., P.Z.S., 1862, 204; Thes. Conch., iii, 234, pl. 250, f. 9, 10; Conch. Icon., xv, pl. 3, f. 20; Angas, P.Z.S., 1867, 201; Chall. Rep., xv, 136; Man. Conch. (1), ix, 12, pl. 4, f. 45, 46. *Solarium modesta*, Phil.: Cooper, T.N.Z.I., xxxi, 137; not of Philippi.

Shell conoidal, solid, flesh-colour, with brown spots. *Sculpture:* Whorls spirally unisulcate or bisulcate near the suture, ribbed at the periphery, spirally sulcate and ribbed above and below the periphery and near the umbilicus, ribs finely crenulated, entire surface of the shell covered with close, obliquely radiating growth-lines. *Colour* pinkish-flesh with interrupted orange-brown bands below the suture, on the ribs about the periphery, and finer bands near the middle of the whorls. *Spire* conoidal, about twice the height of the aperture; outlines slightly convex. *Protoconch* small, convex, reddish-brown, of 2 convex whorls, the first smooth, the second finely spirally striate. *Whorls* about 6, regularly increasing, but little convex, the last sharply carinated; base flat. *Suture* inconspicuous. *Aperture* subquadrangular, slightly oblique. *Peristome* discontinuous, sharp. *Columella* vertical, straight, rounded, and callous, truncate below. *Umbilicus* rather narrow, diameter a little over one-fourth of the minor diameter of the shell, deep, perspective, with crenulated white margin.

Diameter, 22 mm.; height, 14 mm.

Animal unknown.

Type in the British Museum.

Hab.—Whangarei Heads (C. Cooper). Tasmania and Australia (Port Jackson).

The "Challenger" specimens were found in depths from 2 to 10 fathoms.

Subgen. 2. Philippia, Gray, 1840.

Philippia, Gray, in Philippi, Enum. Moll. Siciliæ, i, 174; P.Z.S., 1847, 146. Type: *Solarium luteum*, Lam. *Disculus*, Deshayes, 1863.

Shell without radial sculpture, spiral sculpture nearly obsolete. Operculum flattened; whorls numerous, with the nucleus subcentral; internal face bearing a subspiral calcareous process.

2. Architectonica lutea, Lamarck, 1822. Plate 46, fig. 4.

Solarium luteum, Lam., A.s.V., vii, 1822, 5; Thes. Conch., iii, 237, pl. 253, f. 52–54; Conch. Icon., xv, pl. 3, f. 14; Man. Conch. (1), ix, 16, pl. 5, f. 71, 72.

Shell small, rather thin, conical, periphery spirally ribbed. *Sculpture:* A fine smooth spiral thread above the suture, and 2 cinguli on the periphery; base spirally finely striated; umbilical margin crenulated; growth-lines oblique and fine. *Colour* yellowish, with bands of very fine brown dots on the cinguli above the suture and on the periphery; umbilical crenulations white. *Spire* conical, a little higher than the aperture; outlines a little convex. *Protoconch* minute, mostly

consisting of the convex smooth nucleus only. *Whorls* 5, regularly increasing, flatly convex, the last keeled; base flattish. *Suture* but little impressed. *Aperture* subquadrangular. *Peristome* discontinuous, sharp. *Columella* vertical, broadly rounded. *Umbilicus* small, deep.

Diameter, 12 mm.; height, 9 mm.

Dentition.—Troschel, Das Gebiss d. Schnecken, ii, 156, pl. 15, f. 5.

Type in the Mus. Hist. Nat., Geneva.

Hab.—Whangarei Heads (C. Cooper); Mokohinau Group; Hauraki Gulf (C. Mathews); Wellington (T. W. Kirk); Chatham Islands.

Genus 2. Heliacus, d'Orbigny, 1842.

Heliacus, d'Orb., "Mollusca Cubana," ii, 1842, 68. Type: *Solarium Heberti*, Desh. *Torinia*, Gray, 1840 and 1842 (list-name only). *Teretropoma*, Rochebrune, 1881.

Shell turbinately elevated, or in some instances planorbiform; umbilicus typically moderate to wide, perspective, its margins slightly crenulated; lip and columella simple. Operculum corneous, typically conically elevated, externally spiral, of numerous volutions, margined by projecting edges; internal face smooth, bearing a spirally twisted median projection.

Distribution.—World-wide, tropical and subtropical seas.

Fossil.—Tertiary.

1. **Heliacus variegatus**, Gmelin, 1790. Plate 15, fig. 20.

Trochus variegatus, Gmel., Syst. Nat., ed. xiii, 3575. *Heliacus gyrus*, Meusch., Gronov., 323. *Trochus areolus*, Gmel., Syst. Nat., ed. xiii, 3575. *Heliacus perspectiviunculus*, Dillwyn, Cat., ii, 783. *H. tessellata*, Deshayes, Encycl. Méth., 1830, 160. *Torinia variegata*, Gmel., Man. Conch. (1), ix, 16, pl. 5, f. 75–79. *H. variegatus*, Gm.: Suter, T.N.Z.I., xxxix, 266.

Shell small, depressed, radiately and spirally sculptured, solid. *Sculpture* consisting of close and numerous cinguli, 5 on the upper whorls, 10 on the body-whorl, that below the suture, at the periphery and just below it, being the strongest; they are cut up by fine oblique radiate narrow sulci; umbilicus margined by a stout and crenulate cord. *Colour* radiating alternate stripes of white and brown. *Spire* low, depressed conoidal, of the same height as the aperture; outlines moderately convex. *Protoconch* of 1 smooth whorl. *Whorls* 5, regularly increasing, slopingly convex; base slightly rounded. *Suture* inconspicuous. *Aperture* subcircular. *Peristome* on the outside crenulated by spiral sculpture. *Columella* vertical, broad, with an outer denticle produced by the medial rib of the umbilical wall. *Umbilicus* moderately large, deep, perspective.

Diameter, 13 mm.; height, 7 mm.

Animal unknown.

Hab.—Off Cuvier Island, in 37 fathoms (Captain Bollons). Red Sea, Indian Ocean, Pacific Ocean.

Genus 3. Omalaxis, Deshayes, 1830.

Omalaxis, Desh., Encyclop. Méth., Tabl., 1830. Type: *Solarium bifrons*, Lam. *Omaloxon* (Desh. em.), Agassiz. *Omalaxon* (Agass. em.), Herrmansen. *Omalalaxis* (Desh. ?), Herrmansen. *Bifrontia*, Deshayes, 1832. *Orbis*, Lea, 1833. *Homalaxis* (Desh. em.), Fischer, 1885. *Homalaxon* (as of Agassiz), Watson, 1886. Not *Omalaxis*, Tryon, Syst. Conch., ii, 219.

Shell subdiscoidal, flat or slightly concave above, whorls carinated at the periphery, the last sometimes detached from the others; peristome not continuous; umbilicus wide and deep. Operculum circular, multispiral.

Only few species are known—New England, Brazil, Australasia.

Fossil.—Tertiary.

1. **Omalaxis amœna**, Murdoch and Suter, 1906. Plate 15, figs. 21, *a*, *b*.

Omalaxis amœna, M. & S., T.N.Z.I., xxxviii, 1905 (1906), 293, pl. 24, f. 30–32.

Shell small, discoidal, bicarinate, beautifully sculptured, sides straight but oblique, umbilicus wide, carinated, perspective. *Sculpture:* Upper side with a beaded cord on each side of the suture, the outer one being more prominent; between them are 3 fine elevated spiral threads, the whole crossed by numerous oblique elevated radiating ridges, with equal interspaces, which continue over the periphery to the basal cord; on the periphery is a third beaded and conspicuous cord, which is buried in the suture; still another marginates the base, and between them are 3 small spiral ridges; between the basal and umbilical ribs is a small beaded spiral, the whole reticulated by somewhat irregular distant radiate ribs, interstices having now and again one or more fine ridges; the umbilical rib distinctly beaded. *Colour* white. *Spire* flat. *Protoconch* dextral, smooth, consisting of $1\frac{1}{2}$ convex whorls. *Whorls* $3\frac{1}{2}$, flattened, regularly increasing, with the sides almost straight, subquadrate in section, the base somewhat excavated. *Suture* slightly channelled. *Aperture* subquadrate. *Outer lip* sharp, with 2 angles above and 1 below. *Columella* short, concave. *Umbilicus* large, scalar, with the sides inclined. *Operculum* unknown.

Diameter—Maj., 3 mm.; min., 2·5 mm.: height, 1 mm.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms (one dead shell).

Remarks.—This species is almost identical with *Discohelix retifera*, Dall, from the Pliocene of Florida. A similar form, *O. meridionalis*, Hedley, was dredged in Port Stephens, New South Wales, but it is not so elaborately sculptured.

Fam. EPITONIIDÆ.

Scalariidæ. Scalidæ.

Animal having a retractile proboscis; tentacles close together, long and pointed, the eyes on slight elevations near their outer bases; mantle-margin simple, with a rudimentary siphonal fold; foot trun-

cated in front, extending far in advance of the head. Jaws oval or semicircular, spiny, or denticulated only on the margin; radula composed of elongated uniform or aciculated teeth, many in a series. Sexes distinct.

Shell usually white and polished, turriculated, perforate, but the umbilicus frequently covered by an expansion of the inner lip; whorls numerous, convex, usually loosely coiled, often barely or not at all in contact; aperture entire, circular or oval. Operculum corneous, few-whorled, nucleus nearly central.

The animals of this family are predaceous, and living in all seas; they are somewhat closely allied to the *Janthinæ*, of which they may be regarded as creeping representatives. The shells, remotely suggesting *Turritella*, are remarkable for the extreme elegance of their form and delicacy of sculpture.

KEY TO GENERA.

A. Shell turbinate, aperture channelled in front, umbilicate, umbilicus surrounded and restricted by a callus .. .. CROSSEA.
B. Shell turreted, many-whorled.
a. Whorls longitudinally ribbed or lamellate; peristome continuous, thickened, and reflected; umbilicate or imperforate .. .. EPITONIUM.
aa. Whorls smooth or with spiral riblets, peristome discontinuous, lip thin and simple; perforate .. .. ACLIS.

Genus 1. EPITONIUM, Bolten, 1798.

Epitonium, Bolten, Mus. Bolten. (2), 1798, 91. Type: *Turbo scalaris*, L. *Scala* (Humphrey) of authors. *Cyclostoma*, Lamarck, 1799. *Scalaria*, Lamarck, 1801. *Scalatarius*, Duméril, 1806. *Aciona*, Leach, 1815.

Animal having a short head; tentacles subulate; foot lanceolate behind, truncated in front, with an anterior marginal groove; sole with a posterior longitudinal groove; gill simple, pectinated; intromittant organ large, curved, and pointed; mantle forming a rudimentary siphonal fold at the anterior part of the branchial chamber.

Shell usually white and polished, turriculated, perforate, but the umbilicus frequently covered by an expansion of the inner lip; spire elongated, the apex more or less inflected; whorls numerous, rounded, in contact or separated, ornamented with longitudinal ribs or thin lamellæ, often continuous across the suture; peristome entire, thickened, reflected.

The genus commenced in the Trias, and has continued its development to the present time; about 200 fossil species have been described, and not far from the same number Recent. They are found from low water to 80, 100, or 400 fathoms, and occur throughout the world, the Arctic seas furnishing representations of peculiar type; but the largest, finest, and most typical species are tropical. The West Indian province appears to be the metropolis of the genus.

Vernacular Name.—Wentle-trap shell.

Key to Species.

A. Shell without a basal spiral ridge.
  a. Whorls a little separated; umbilicated. About 20 axial lamellæ, interstices smooth .. .. .. *tenellum.*
  aa. Whorls united; umbilicus covered.
    b. About 10 axial lamellæ on body-whorl .. .. *philippinarum.*
    bb. About 20 axial lamellæ on body-whorl .. .. *Jukesianum.*
B. Shell with a basal spiral ridge.
  a. Axial ribs strong, 13–16 on body-whorl; interstices spirally ribbed .. .. *Zelebori.*
  aa. Axial riblets numerous, filiform; body-whorl tricarinate *levifoliatum.*

Sect. 1. Epitonium, s. str.

Shell having the whorls a little separated, crossed by regular lamelliform axial ribs; umbilicated.

1. Epitonium tenellum, Hutton, 1885. Plate 46, fig. 5.

Scalaria lineolata, Kiener: Hutton, C.M.M., 22; not of Kiener. *S. lyra*, Sowerby: Hutton, M.N.Z.M., 70; not of Sowerby. *S. tenella*, Hutton, P.L.S. N.S.W., ix, 1885, 943. *S. novoseelandica*, Clessin, Conch. Cab., Scalariidæ, 1897, 57, pl. 15, f. 4; Suter, J. Mal., vii, 1899, 54.

Shell rather small, perforate, thin and fragile, translucent, acuminate, usually with a brown band on the anterior part of the body-whorl. *Sculpture* consisting of arcuate lamellar axial ribs, most of them discontinuous over the whorls, about 20 on the last whorl; interstices smooth. *Colour* light horny, with a narrow brown band below the suture on the last few whorls, continued from the suture and bounding the base on the body-whorl; a very faintly brown band is sometimes present on the periphery; riblets white. *Spire* elevated, conic, about 1½ times the height of the aperture; outlines straight. *Protoconch* small, sharply conic, of about 3 smooth and convex whorls. *Whorls* 8 to 9, convex, very little shouldered; base convex. *Suture* deep. *Aperture* slightly oblique, oval. *Peristome* continuous in adult specimens, thickened by an axial rib, edge blunt, slightly effuse below. *Columella* short, oblique, slightly arcuate. *Inner lip* very little expanded, with a free and sharp margin, leaving the narrow umbilical perforation open. *Operculum* unknown.

Diameter, 5 mm.; height, 11·5 mm. Angle of spire, 32°.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Auckland Harbour; Bay of Islands. Also Tasmania and Australia.

Remark.—Perfectly white specimens are sometimes found.

Sect. 2. Clathrus, Oken, 1815.

Clathrus, Oken, "Lehrbuch der Zoologie," 1815. Type: *Scalaria communis*, Lam.

Shell moderately thick, often coloured, whorls united; longitudinal ribs usually numerous, aperture suboval, umbilicus covered by the inner lip, no basal rib.

2. Epitonium philippinarum, Sowerby, 1844.. Plate 46, fig. 6.

Scalaria philippinarum, Sow., P.Z.S., 1844, 12; Thes. Conch., i, 86, pl. 32. f. 1–3; Conch. Icon., xix, pl. 4, f. 21; Man. Conch. (1), ix, 66, pl. 13. f. 18, 19; Pritchard and Gatliff, P.R.S. Vic., xiii (n.s.), 144.

Shell rather small, fairly thin, semitransparent, imperforate. *Sculpture* consisting of distant, axial, sharp, and elevated lamellar ribs, angularly produced above, continuous over the whorls and the suture, about 10 on the last whorl, continued over the base; interstices smooth and polished. *Colour* uniformly white or fulvous between the lamellæ. *Spire* sharply conic, about twice the height of the aperture; outlines straight. *Protoconch* small, of 1 convex and pointed whorl. *Whorls* 7 to 8, convex; base rounded. *Suture* very deep. *Aperture* slightly oblique, oval. *Peristome* continuous, thickened outside by a strong varix formed by the last axial rib, pointed below the suture and the columella, broadened over the umbilical tract. *Columella* short, arcuate, and rounded. *Operculum* unknown.

Diameter, 5 mm.; height, 14 mm. Angle of spire, 27°.

Animal unknown.

Type in the British Museum.

Hab. — Bay of Islands; Waiwera; Rangitoto Channel, in 4 fathoms (H. S.). Found also in Australia, the Philippine Islands, Amboina, &c.

3. Epitonium Jukesianum, Forbes, 1852. Plate 46, fig. 7.

Scalaria Jukesiana, Forbes, Voy. "Rattlesnake," ii, Append., 383, pl. 3, f. 7; Conch. Icon., xix, pl. 11, f. 80; Man. Conch. (1), ix, 66, pl. 14, f. 20; Hutton, P.L.S. N.S.W., ix, 943. *Scala Jukesiana*, Forbes: Pritchard and Gatliff, P.R.S. Vic., xiii (n.s.), 143. *Scalaria delicatula*, Crosse and Fischer, J. de Conch., 1864, 347; 1865, 42, pl. 3, f. 9, 10: Conch. Icon., xix, pl. 15, f. 115: Man. Conch. (1), ix, 69, pl. 14, f. 39. *S. wellingtonensis*, T. W. Kirk, T.N.Z.I., xii, 1879 (1880), 307.

Shell rather small, turreted, white, translucent, slightly polished, imperforate. *Sculpture* consisting of numerous axial, lamellose, and a little reflexed ribs, slightly produced above, continuous over the whorls, about 20 on the last whorl, interstices smooth, the sculpture extending over the whole of the base. *Colour* pure-white. *Spire* high conic, about three times the height of the aperture; outlines straight. *Protoconch* consisting of 3 slightly convex smooth whorls. *Whorls* 11, convex; base rounded. *Suture* deeply impressed, the costæ continued over it. *Aperture* oblique, orbicular. *Peristome* continuous, but thin over the parietal wall, thickened outside by the last riblet, edge blunt, rounded, expanded on the umbilical tract. *Columella* short, arcuate. *Inner lip* not reflexed, sharp. *Operculum* unknown.

Diameter, 4 mm.; height, 13 mm. Angle of spire, 28°.

Animal unknown.

Type in the British Museum.

Hab.—Auckland Harbour, among shell-sand (Cheeseman); Whangarei Heads (C. Cooper); Gisborne (A. Hamilton); Cook Strait: in 2 to 10 fathoms. Also Australia and Tasmania.

Remark.—Of *E. wellingtonensis*, Kirk, three type specimens are in the Dominion Museum; they are not *E. philippinarum*, as suggested by Tryon.

Sect. 3. Opalia, H. and A. Adams, 1853.

Opalia, H. & A. Ad., Ad. G.R.M., i, 222. First species: *Scalaria australis*, Lam. *Cluthrus*, Gray; not of Oken.

Shell turreted, imperforate; whorls not disunited, the last with a conspicuous spiral ridge round the umbilical region.

4. Epitonium Zelebori, Dunker, 1866. Plate 46, fig. 8.

Scalaria Zelebori, Dkr., V.Z.B.G. Wien, xvi, 1866, 912. *Scala* (*Opalia ?*) *Zelebori*, Dkr.: Frauenfeld, "Novara" Moll., 1867, 7, pl. 1, f. 6. *Scalaria intermedia*, Hutton, Cat. Tert. M., 10. *S. Zelebori*, Dkr.: Hutton, C.M.M., 21; M.N.Z.M., 69. *S. Reevei*, Clessin, Conch. Cab., Scalariidæ, 1897, 63, pl. 15, f. 9; Suter, J. Mal., vii, 54. *S. Zelebori*, Frfld., Man. Conch. (1), ix, 78, pl. 15, f. 75.

Shell of moderate size, solid, white, imperforate, with axial and spiral sculpture, not shining. *Sculpture* consisting of rather distant, oblique, thick, and denticulate axial ribs, continuous over the whorls and extending over the base, angularly produced above, 13 to 16 on the last whorl; interstices with 6 to 8 rounded and prominent spiral ribs, with fine spiral striæ between them; base with a distinct spiral keel. *Colour* white. *Spire* elevated conic, about five times the height of the aperture; outlines straight. *Protoconch* of 2 smooth and strongly convex whorls; apex sharply pointed. *Whorls* 10 to 11, regularly increasing, convex; base slightly concave. *Suture* very deep, the costæ passing angularly over it. *Aperture* almost circular, oblique. *Peristome* continuous. The *outer lip* outside varicose and denticulate. *Basal lip* slightly expanded below the pillar. *Columella* short, arcuate, rounded. *Inner lip* not expanded. *Operculum* not known.

Diameter, 8 mm.; height, 24 mm. (type). Angle of spire, 28°.

Animal unknown.

Type in the K.K. Hofmuseum, Vienna.

Hab.—Ahipara Beach; Bay of Islands; Whangarei Heads (C. Cooper); Auckland Harbour, and dredged near Waiwera (Cheeseman); off Great Barrier Island, in 110 fathoms; Tauranga; Stewart Island; Chatham Islands; Kermadec Islands.

Fossil.—Miocene and Pliocene.

Sect. 4. Acrillus, H. Adams, 1860.

Acrillus, H. Ad., P.Z.S., 1860, 241. Type: *Scalaria acuminata*, Sow.

Shell moderately thick, turritelliform; whorls united, with very numerous filiform ribs, last whorl with subcarinated periphery; lip of aperture thin.

Page 322.—*Omit*—

"Sect. 3. Opalia, H and A. Adams, 1853."

and the succeeding four lines, and *replace* it by—

"Sect. 3. Cirsotrema, Moerch, 1852.

Cirsotrema, Moerch, Cat. Yoldi, 1852, 48. Type: *Scalaria varicosa* Lam.
Caloscala, Tate, 1885.

"Axial lamellæ frequently crisped; spiral threads occasionally very large; outer lip with a thick crenate marginal varix."

Face page 322.]

whorls 10, regularly increasing, with straight sides above the keel, concave between the encircling ribs. *Suture* deep and channelled, which character is partly hidden by the axial laminæ passing over it. *Aperture* ovate, angled above. *Outer* and *basal lip* rounded, slightly effuse, sharp, and with flexuous projections corresponding to the spiral keels. *Columella* concave, very little callous, terminating in a minute sharp point.

Diameter, 1·62 mm.; height, 5·7 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms (type); Little Barrier Island, in 20 fathoms (R. H. Shakespear); near the Snares, in 50 fathoms (Captain Bollons). Also dredged in 80 fathoms twenty-two miles east of Narrabeen, New South Wales, by Mr. C. Hedley.

Genus 2. Crossea, A. Adams, 1865.

Crossea, A. Ad., A.M.N.H. (3), xv, 1865, 323. Type: *C. miranda*, A. Ad.

Shell small, umbilicate, conical or turbinate; whorls convex, reticulated, simple or varicose; aperture rounded, prolonged anteriorly, where it is deeply notched and somewhat canaliculate; umbilicus bordered by a long, curved, raised rim, which is often crenulated.

Distribution.—Japan, Australia, Tasmania, and New Zealand.

Fossil in the Tertiary of Australia.

Key to Species.

A. Shell smooth, except a prominent ridge on the base, and a second arising from the umbilicus .. .. *glabella.*
B. Shell sculptured.
a. Surface spirally lirate, a smooth zone above the umbilical rim *labiata.*
aa. Body-whorl with 6 spiral liræ and a faint 7th on the base, the interspaces cancellated by axial riblets .. .. *cancellata.*

Hab.— Auckland Harbour, among shell-sand (Cheeseman): Wha-

spiral sculpture, not shining. *Sculpture* consisting of rather distant, oblique, thick, and denticulate axial ribs, continuous over the whorls and extending over the base, angularly produced above, 13 to 16 on the last whorl; interstices with 6 to 8 rounded and prominent spiral ribs, with fine spiral striæ between them; base with a distinct spiral keel. *Colour* white. *Spire* elevated conic, about five times the height of the aperture; outlines straight. *Protoconch* of 2 smooth and strongly convex whorls; apex sharply pointed. *Whorls* 10 to 11, regularly increasing, convex; base slightly concave. *Suture* very deep, the costæ passing angularly over it. *Aperture* almost circular, oblique. *Peristome* continuous. The *outer lip* outside varicose and denticulate. *Basal lip* slightly expanded below the pillar. *Columella* short, arcuate, rounded. *Inner lip* not expanded. *Operculum* not known.

Diameter, 8 mm.; height, 24 mm. (type). Angle of spire, 28°.

Animal unknown.

Type in the K.K. Hofmuseum, Vienna.

Hab.— Ahipara Beach; Bay of Islands; Whangarei Heads (C. Cooper); Auckland Harbour, and dredged near Waiwera (Cheeseman); off Great Barrier Island, in 110 fathoms; Tauranga; Stewart Island; Chatham Islands; Kermadec Islands.

Fossil.—Miocene and Pliocene.

Sect. 4. Acrillus, H. Adams, 1860.

Acrillus, H. Ad., P.Z.S., 1860, 241. Type: *Scalaria acuminata*, Sow.

Shell moderately thick, turritelliform; whorls united, with very numerous filiform ribs, last whorl with subcarinated periphery; lip of aperture thin.

5. Epitonium levifoliatum, Murdoch and Suter, 1906. Plate 16, fig. 1.

Scala levifoliata, M. & S., T.N.Z.I., xxxviii, 1905 (1906), 295, pl. 25, f. 35, 36.

Shell small, turreted, imperforate, longitudinally finely laminated. *Sculpture :* Spire-whorls bicarinate, the slope uniform from the suture to the upper carina, situate on the lower half of the whorls ; the lower carina is less conspicuous, and close to the suture ; last whorl tricarinate with the basal keel microscopically granulate, below this is a well-marked furrow bounded by a small concentric rib, which margins the columella ; on the lower part of the shoulder 2 indistinct spiral threads, more obscure on the upper whorls ; the axial sculpture consists of oblique, close, delicate, undulating, and sharp laminations, extending over the suture, and terminating at the basal carina. *Colour* greyish-white. *Spire* elongate, turreted, sharply pointed, about four times the height of the aperture. *Protoconch* of 2 small rounded whorls, the nucleus with the initial half-turn smooth, the other half radiately delicately ribbed, the second whorl with sharp laminations. *Whorls* 10, regularly increasing, with straight sides above the keel, concave between the encircling ribs. *Suture* deep and channelled, which character is partly hidden by the axial laminæ passing over it. *Aperture* ovate, angled above. *Outer* and *basal lip* rounded, slightly effuse, sharp, and with flexuous projections corresponding to the spiral keels. *Columella* concave, very little callous, terminating in a minute sharp point.

Diameter, 1·62 mm. ; height, 5·7 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms (type) ; Little Barrier Island, in 20 fathoms (R. H. Shakespear) ; near the Snares, in 50 fathoms (Captain Bollons). Also dredged in 80 fathoms twenty-two miles east of Narrabeen, New South Wales, by Mr. C. Hedley.

Genus 2. Crossea, A. Adams, 1865.

Crossea, A. Ad., A.M.N.H. (3), xv, 1865, 323. Type : *C. miranda*, A. Ad.

Shell small, umbilicate, conical or turbinate ; whorls convex, reticulated, simple or varicose ; aperture rounded, prolonged anteriorly, where it is deeply notched and somewhat canaliculate ; umbilicus bordered by a long, curved, raised rim, which is often crenulated.

Distribution.—Japan, Australia, Tasmania, and New Zealand.

Fossil in the Tertiary of Australia.

Key to Species.

A. Shell smooth, except a prominent ridge on the base, and a second arising from the umbilicus .. .. *glabella.*

B. Shell sculptured.

a. Surface spirally lirate, a smooth zone above the umbilical rim *labiata.*

aa. Body-whorl with 6 spiral liræ and a faint 7th on the base, the interspaces cancellated by axial riblets .. .. *cancellata.*

1. Crossea cancellata, T.-Woods, 1878. Plate 16, fig. 2.

Crossea cancellata, T.-Woods, P.R.S. Tas., 1877 (1878), 122; Tate and May, P.L.S. N.S.W., 1901, 380, pl. 23, f. 1; Verco, T.R.S. S.Aust., xxx, 1906, 149; Suter, T.N.Z.I., xxxix, 267. *Delphinula Johnstoni*, Beddome, P.R.S. Tas., 1881 (1882), 31; 1882 (1883), 169.

Shell small, globosely turbinate, perforate, fairly solid, with conspicuous axial and spiral ribs. *Sculpture* consisting of prominent spiral ribs, 3 on the upper whorls, 6 on the body-whorl, 4 of which are above the suture; there is a faint indication of a seventh spiral on the base; the second, third, and fourth spirals are stronger than the others, smooth and rounded; interstices broader than the spirals; axial sculpture formed by equidistant, oblique, somewhat strong riblets, which do not pass over the spiral cords, but strongly cancellate their interspaces, and extend over the whole of the base; the umbilical rim very stout and finely crenulated by the axial riblets. *Colour* white. *Spire* depressed conoidal, about as high as the aperture; outlines convex. *Protoconch* small, of 1 smooth whorl, flatly convex. *Whorls* 4, convex; base rounded. *Suture* distinct. *Aperture* subvertical, almost circular, broadly angled above, typically canaliculated at the base, but my New Zealand examples show this very indistinctly. *Peristome* continuous, thick, and blunt. *Columella* vertical, somewhat arcuate, produced below into a tongue-shaped process, and leaving a deep groove between it and the umbilical callosity. *Perforation* narrow. *Operculum* unknown.

Diameter, 2·5 mm.; height, 2·6 mm. (specimen from Whangaroa).

Animal unknown.

Type in the Tasmanian Museum, Hobart.

Hab.—Whangaroa Harbour; near Cuvier Island, in 38 fathoms (Captain Bollons). Also Tasmania and Australia, in 20 fathoms. The type is from Blackman's Bay, Tasmania.

2. Crossea glabella, Murdoch, 1905. Plate 16, fig. 3.

Crossea glabella, Murd., T.N.Z.I., xxxvii, 1904 (1905), 225, pl. 8, f. 16, 17.

Shell minute, turbinate, smooth, and rather solid. *Sculpture* none, except a prominent ridge on the base bounding a broad depression, and a second ridge arising from the umbilicus. *Colour* white, somewhat shining. *Spire* depressed, less than the height of the aperture; outlines convex. *Protoconch* consisting of 1½ smooth and convex whorls, the nucleus rather large and globose. *Whorls* 3, convex; base somewhat convex. *Suture* distinct, not deep, margined below by a narrow ridge, followed by a slight depression. *Aperture* subcircular, angled above, and slightly canaliculated below. *Outer lip* thin and sharp. *Columella* vertical, arcuate. *Inner lip* slightly reflected, covering only a small part of the umbilicus. *Basal lip* with 2 well-marked expansions, produced by the two basal ridges. *Umbilicus* narrow, deep. *Operculum* unknown.

Diameter, 1·94 mm. ; height, 1·97 mm. (type).

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Whangaroa Harbour, type (C. Traill) ; Stewart Island and Foveaux Strait, in 15 fathoms ; off Otago Heads, dredged (A. Hamilton) ; Dusky Sound, in 30 fathoms (R. Henry) ; near the Snares, in 50 fathoms (Captain Bollons).

3. Crossea labiata, T.-Woods, 1876. Plate 16, fig. 4.

Crossea labiata, T.-Woods, P.R.S. Tas., 1875 (1876), 151 ; Hedley, P.L.S. N.S.W., 1900, 500, pl. 26, f. 18 ; Tate and May, *l.c.*, 1901, 379 ; Verco, T.R.S. S.Aust., 1906, 149.

Shell small, globosely turbinate, narrowly umbilicate, somewhat solid. *Sculpture* consisting of equidistant spiral liræ, which are flat, with narrower interspaces, and crossed by very fine arcuate growth-lines ; there is a narrow smooth zone above the umbilical rim, but the spiral sculpture is present in the umbilicus. *Colour* horny, sometimes white. *Spire* conoidal, height a little less than that of the aperture ; outlines somewhat convex. *Protoconch* small, of $1\frac{1}{2}$ smooth whorls, obtuse. *Whorls* 5, convex, the last very large in proportion ; base flatly rounded. *Suture* distinct. *Aperture* ovate, angled above, and with a canaliculate angular projection below. *Peristome* continuous. *Outer lip* subreflexed, and in quite adult specimens with a fringe-like varix outside. *Columella* vertical, slightly arcuate, narrowed toward the base. *Inner lip* spreading only a short distance beyond the columella, and narrowing a little the small umbilical perforation. *Umbilicus* margined with a round smooth callus, sometimes subcrenulated by a few axial folds. *Operculum* unknown.

Diameter, 2·5 mm. ; height, 3·5 mm. The type measures 2 mm. by 4 mm.

Animal unknown.

Type in the Tasmanian Museum, Hobart.

Hab.—Near Little Barrier Island, in 20 fathoms (R. H. Shakespear) ; Taumaki Island, west coast of the South Island, in 10 fathoms (Captain Bollons). Also in Tasmania and Australia, in 5 to 10 fathoms. The type is from Long Bay, Tasmania, 10 fathoms, sand.

Genus 3. Aclis, Lovén, 1846.

Aclis, Lovén, Ind. Moll. Scand., 1846, 16. Type: *A. supranitida*, Wood. *Ebala*, Gray.

Animal having a long retractile proboscis ; the tentacles close together at the base, slender, cylindrical, eyes sessile at their external bases ; foot truncate ; mentum narrower than the sole, and extending far beyond the head ; operculigerous lobe ample, unsymmetrical. Radula of numerous simple aculeiform teeth.

Shell small, narrowly umbilicated or rimate, turreted, subulate, smooth or usually with spiral riblets; aperture oval, entire, the peristome discontinuous; lip thin, simple. Operculum corneous, thin, ear-shaped, paucispiral, with marginal nucleus.

Only a small number of living forms are known, mostly from the European seas, and about a dozen fossil species, commencing with the Devonian, are referred to the genus. One species, *Aclis costellata*, Hutt., has been found in the Pliocene of Wanganui.

Aclis resembles *Turritella* in form, but is much smaller and typically umbilicated.

KEY TO SPECIES.

A. Whorls convex; fine axial costæ, obsolete on the base, which bears minute spiral striæ. Umbilical chink narrow or obsolete .. .. *semireticulata.*

B. Whorls shouldered; 4 spiral threads on the spire-whorls, interstices reticulated by finer axial threads. Perforation narrow, open .. .. *succincta.*

1. Aclis semireticulata, Murdoch and Suter, 1906. Plate 16, fig. 5.

Aclis semireticulata, M. & S., T.N.Z.I., xxxviii, 1905 (1906), 294, pl. 24, f. 33, 34.

Shell small, subulate, with a rounded base, subrimate, longitudinally costate, and with a spiral thread on the last whorl. The spiral *sculpture* consists of some minute striæ upon the base, occasionally extending above the periphery, and usually absent on the spire-whorls: the axial ornamentation formed by small rounded costations, obsolete or absent on the base, and generally very variable, some fairly uniform throughout, others feeble on the last whorl, and others again more or less obsolete on all whorls. *Colour* light horny, hyaline. *Epidermis* very thin, glossy, membranaceous, present on a few specimens only. *Spire* conical, higher than the aperture, with a blunt apex. *Protoconch* formed by about 2 smooth rounded and vitreous volutions. *Whorls* 6, regularly increasing, rounded; base convex. *Suture* deep, margined above by a minute threadlet, which strengthens upon the later whorls, and at last forms a distinct thread below the periphery upon the body-whorl. *Aperture* broadly ovate. *Outer lip* regularly rounded, slightly varicose, the varix usually set a little back from the edge. *Columella* excavated, mostly a little produced below, forming an angulation of the aperture. *Inner lip* forming a small callosity upon the parietal wall and the columella. *Umbilical chink* very narrow or obsolete. *Operculum* unknown.

Diameter, 1·7 mm.; height, 3·3 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms.

Remarks.—This species may represent the *Aclis* (*Rissopsis*) *hyalina*, Hutton (N.Z.J.S., ii, 1884, 173), the type of which seems to be lost. Hutton's species is unfigured, and the description scarcely sufficiently full to identify it with certainty. In any case, *A. hyalina*, Hutt., cannot stand, the name being preoccupied by Watson.

2. Aclis succincta, Suter, 1908. Plate 16, fig. 6.

Aclis succincta, Suter, T.N.Z.I., xl, 1907 (1908), 362, pl. 28, f. 4.

Shell very small, turreted, perforate, hyaline and somewhat shining. *Sculpture* consisting of spiral threads, one upon the middle of the shoulder, the second (most prominent of all) on the angle of the shoulder, the third (slightly finer) a little below the periphery, and the fourth just above the suture; base with a few additional liræ; the whole crossed by oblique rather distant axial lines reticulating the interstices and extending over the base; the axial sculpture by far not so conspicuous as the spiral. *Colour* light horny. *Spire* turriculate, much higher than the aperture; outlines straight. *Protoconch* small, obtuse, spirally sharply ridged. *Whorls* 6, regularly increasing, distinctly shouldered, and angularly narrowed again below the periphery; base convex. *Suture* distinct, margined above by the fourth spiral. *Aperture* subvertical, oval. *Peristome* discontinuous, sharp. *Columella* vertical, somewhat arcuate, a little broadened and subtruncated below. *Perforation* narrow, open. *Operculum* unknown.

Diameter, 1·1 mm.; height, 2·6 mm.

Animal unknown.

Type in my collection.

Hab.—Near the Snares, in 50 fathoms (Captain Bollons).

AGLOSSA.

The two following families of *Tænioglossa Platypoda* have neither radula nor jaw, and are therefore called *Aglossa* or *Gymnoglossa*. They are suctorial animals, with a well-developed proboscis, and are often commensal or parasitic on Echinoderms; some are abyssal. A third family, *Entoconchidæ*, is included, but none of its members have hitherto been recorded from New Zealand.

Fam. PYRAMIDELLIDÆ, Gray.

Animal with 2 flattened, subtriangular or elongate tentacles, grooved or auriform in the larger forms, the funicles with a ciliated area; below the tentacles an oral orifice, from which extends a long, retractile, subcylindric proboscis, but there is no muzzle like that of *Epitonium;* below the oral orifice is a distinct elongated projection, named by Lovén the "mentum," which is usually more or less medially grooved or fissured. Foot short, moderately pointed behind, with a small operculigerous lobe above and sometimes a small tentacular

appendix on each side, in front feebly auriculate or undulate ; mantle slightly canaliferous on the right upper margin ; a single branchia ; verge subcylindric, elongate.

Shell turreted, with a plicate axis ; the outer lip frequently internally lirate ; in the larger forms the aperture is obscurely channelled in front ; the larval shell is sinistral, the adult dextral, the former frequently set at an angle to the adult axis, or more or less immersed in the adult apical whorls ; it is usually helicoid and smooth ; the sculpture varies from nothing to ribbed, spirally sulcate or reticulate ; the coloration, when present, usually reddish, brownish, or yellow. Operculum ovoid, paucispiral, with the apex anterior, a thread-like arcuate ridge on the outer side, the inner margin notched in harmony with the plaits of the pillar when present.

The distribution is world-wide, but the larger forms are mostly tropical. They occur first in the Cretaceous, are numerous in the Tertiary, but perhaps are most fully developed in the existing faunas.

KEY TO GENERA.

A. Shell elongate-conic, whorls usually inflated and regularly increasing ; the pillar with from 1 to 3 folds, but wanting in *Eulimella* .. .. PYRAMIDELLA.

B. Shell cylindro-conic, many-whorled, generally slender ; no columellar fold ; shell usually smaller than in *Pyramidella* and larger than in *Odostomia* .. .. .. TURBONILLA.

C. Shell usually short, few-whorled, subconic or ovate ; columellar fold single, varying in strength .. .. .. ODOSTOMIA.

Genus 1. PYRAMIDELLA, Lamarck, 1799.

Pyramidella, Lam., Mém. Soc. Hist. Nat. Paris, 1799, 76. Type : *Trochus dolabratus*, L. *Obeliscus*, Humphrey, 1797 (*fide* Mörch, 1852).

Animal having the tentacles large, ear-shaped, the eyes at their inner bases ; mentum large, flattened, divided by a deep median longitudinal fissure ; foot obtuse.

Shell with elevated sharp-pointed spire, many-whorled, smooth or axially ribbed ; aperture suboval, entire, rounded in front ; columella straight, with prominent spiral plications ; outer lip sharp, often plicate within. Operculum semicircular, horny, subspiral, the nucleus at the front end, its columellar edge notched to fit the folds of the columella.

Inhabits mostly tropical seas.

Fossil.—Cretaceous and Tertiary.

KEY TO SUBGENERA.

A. Shell without columellar plication .. .. .. EULIMELLA.
B. Shell with 1 columellar fold .. .. SYRNOLA.

Subgen. 1. Eulimella, Forbes, 1846.

Eulimella, Forbes, Ann. Nat. Hist., xiv, 1846, 412. Type: *E. crassula*, Forbes = *E. scillæ*, Scacchi.

Animal with short tentacles; mentum lobed in front; anterior extremity of foot truncated.

Shell small, elongated, subcylindrical, turriculate, rather solid, smooth, polished; whorls numerous, apex sinistral; aperture subquadrangular or suboval; peristome discontinuous; columella straight, without plications. Operculum with a spiral groove, columellar margin entire.

Key to Species.

A. Shell microscopically spirally striate .. .. *levilirata.*
B. Shell without spiral striation.
a. Suture distinctly channelled .. .. *limbata.*
aa. Suture distinct, but not channelled; submargined .. .. *cœna.*

1. Pyramidella cœna, Webster, 1905. Plate 16, fig. 7.

Eulimella cœna, Webster, T.N.Z.I., xxxvii, 1904 (1905), 279, pl. 10, f. 11.

Shell, small, subulate, smooth and polished, imperforate. *Sculpture* none, except very fine growth-lines. *Colour* white. *Spire* high, the top sometimes slightly turned to the left, outlines straight. *Protoconch* heterostrophe, of 2 convex and smooth whorls, with the nucleus lateral. *Whorls* 8 to 9, regularly increasing, flatly convex; base rounded. *Suture* well marked, submargined below by a smooth narrow band. *Aperture* vertical, suboval, angled above, oval and slightly effuse below. *Outer lip* slightly convex, sharp. *Basal lip* arcuate and somewhat expanded. *Columella* subvertical, slightly twisted, subtruncate below. *Inner lip* rather broad, spreading sometimes a little beyond the pillar, but not reflexed. *Operculum* unknown.

Diameter, 1·2 mm.; height, 3·8 mm. (specimen of 8 whorls).

Animal unknown.

Type in Mr. W. H. Webster's collection.

Hab.—Takapuna Reef, in sand (W. H. Webster); Banks Peninsula (Iredale).

Remarks.—The height, 2½ mm., is evidently wrong. If the figure is correct it should be 3·5 mm. I found the shell to be not uncommon in the locality mentioned.

2. Pyramidella levilirata, Murdoch and Suter, 1906. Plate 16, fig. 8.

Eulimella leviliata, M. & S., T.N.Z.I., xxxviii, 1905 (1906), 296, pl. 25, f. 38.
E. deplexa, Hutton, Index, 74; not of Hutton.

Shell small, subulate, imperforate, many-whorled. *Sculpture* consisting of microscopic fine close and linear spiral grooves, crossed by very fine unequally spaced growth-lines. *Colour* white, glossy. *Spire* long and subulate. *Protoconch* smooth, with a heterostrophe, minute, rounded, and lateral nucleus. *Whorls* 7 to 8, slowly and regularly

increasing; sides flatly convex; base rounded. *Suture* well impressed and distinct. *Aperture* vertical, subovate, sides nearly parallel, angled above, slightly effuse below. *Outer* and *basal lip* simple, sharp. *Columella* straight and vertical, rounded. *Inner lip* not broad, with a sharp edge, spreading as a thin layer over the parietal wall. *Operculum* unknown.

Diameter, 1·4 mm.; height, 6 mm. (type). Diameter, 1·4 mm.; height, 4·8 mm. (specimen from Little Barrier, of 8 whorls).

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms (type); near Little Barrier Island, in 20 fathoms (R. H. Shakespear); Lyttelton Harbour (H. S.); dredged off Otago Heads (A. Hamilton); near Cuvier Island, in 38 fathoms (Captain Bollons).

Remarks.—The specimen I once found in Lyttelton Harbour, and which I took for *E. deplexa*, Hutton, shows distinct microscopic spiral striations, and has no callus on the umbilical tract.

3. Pyramidella limbata, Suter, 1908. Plate 16, fig. 9.

Pyramidella (*Eulimella*) *limbata*, Suter, T.N.Z.I., xl, 1907 (1908), 362, pl. 28, f. 5.

Shell small, subulate, imperforate, polished, with channelled suture. *Sculpture* consisting simply of straight growth-lines, slightly plicate on some of the whorls. *Colour* white. *Spire* subulate, much higher than the aperture; outlines straight. *Protoconch* heterostrophe, of 2 smooth whorls, the nucleus lateral. *Whorls* about 9, regularly increasing, flatly rounded; base convex. *Suture* very distinctly channelled. *Aperture* vertical, suboval, the sides subparallel, the base angularly effuse. *Peristome* solid, but not thickened, rather sharp. *Basal lip* expanded. *Columella* straight, subtruncate below. *Inner lip* not reflexed. *Operculum* unknown.

Diameter, 1·5 mm.; height, 5 mm.

Animal unknown.

Type in my collection.

Hab.—Bay of Islands (type); Takapuna Reef, in sand (H. S.).

Subgen. 2. Syrnola, A. Adams, 1862.

Syrnola, A. Ad., P.Z.S., 1862, 233. Type: *S. gracillima*, A. Ad.

Shell small, subulate, polished; whorls flattened, suture well marked; columella with a single plication; outer lip simple.

Key to Species.

A. Shell smooth, without spiral microscopic striation; with a narrow brown band .. .. *pulchra.*

B. Shell with microscopic spiral striation; not banded.

a. Suture channelled, columellar fold feeble .. .. *tenuiplicata.*

aa. Suture not channelled, but margined below by a smooth band; columellar fold distinct .. .. .. *lurida.*

4. Pyramidella lurida, Suter, 1908. Plate 16, fig. 10.

Pyramidella (*Syrnola*) *lurida*, Suter, T.N.Z.I., xl, 1907 (1908), 347, pl. 27, f. 4.

Shell small, subulate, imperforate, smooth and polished. *Sculpture* consisting of very fine and close microscopic spiral striæ; the fine and nearly straight growth-lines distinct. *Colour* white. *Spire* high, subulate, much higher than the aperture; outlines but faintly convex. *Protoconch* heterostrophe, of 1 smooth globular and polished whorl. *Whorls* 7, regularly increasing, faintly convex; base rounded. *Suture* well impressed, margined below by a distinct narrow smooth band. *Aperture* subvertical, elongate-ovate, angled above and narrowly rounded below. *Outer lip* thin and sharp. *Columella* subvertical, arcuate, with a distinct plait above, which is continued as a narrow ridge over the pillar down to the base, and uniting with the basal lip; there is no callosity upon the parietal wall. *Operculum* unknown.

Diameter, 1·6 mm.; height, 6 mm.

Animal unknown.

Type in my collection.

Hab.—Five miles south of Cuvier Island, in 38 fathoms (Captain Bollons).

5. Pyramidella pulchra, Brazier, 1877. Plate 16, fig. 11.

Syrnola pulchra, Braz., P.L.S. N.S.W., i, 1877, 261; Hedley, Rec. A.M., iv, No. 3, 125, pl. 16, f. 20.

Shell small, perforate, fairly solid, and polished, with a narrow brown band. *Sculpture* consisting of fine straight growth-lines only. *Colour* cream-white, with a fine dark-brown spiral band above the suture on the last four whorls, at the periphery on the body-whorl. *Spire* high, subcylindrical, tapering towards the apex, much higher than the aperture. *Protoconch* lost in the type as well as in my specimen. *Whorls* about 9 to 11, regularly increasing, sides almost straight; base flattish. *Suture* deep, channelled. *Aperture* vertical, elongately oval, angled above, slightly expanded at the base, half-way down with 4 prominent lines of striæ, the upper one thickest. *Peristome* thin and sharp. *Columella* subvertical, short, arcuate, with a distinct plait above. *Inner lip* spreading but little beyond the pillar, but covering the whole width of the parietal wall. *Umbilical chink* narrow, open. *Operculum* unknown.

Diameter, 1·5 mm.; height, 4·8 mm. (decollated specimen of 7 whorls).

Animal unknown.

Type in the Macleay Museum, Sydney.

Hab.—Five miles south of Cuvier Island, in 38 fathoms (Captain Bollons).

Remarks.—The type, of the Chevert Expedition, is from Darnley Island; it is adorned with an additional narrow band upon the base, which is wanting in my only specimen.

6. **Pyramidella tenuiplicata,** Murdoch and Suter, 1906. Plate 16, fig. 12.

Pyramidella (*Syrnola*) *tenuiplicata,* M. & S., T.N.Z.I., xxxviii, 1905 (1906), 296, pl. 25, f. 39.

Shell minute, subulate, imperforate, white and porcellanous, with a high spire and pointed apex. *Sculpture* consists of some microscopic irregular spiral striæ. *Colour* white, shining. *Spire* slender and tapering, much higher than the aperture. *Protoconch* heterostrophe, of 2 smooth whorls, the nucleus lateral. *Whorls* 7, regularly increasing, lightly convex, body-whorl with a minute thread-like carina only noticeable in front of the aperture; base rounded. *Suture* channelled. *Aperture* ovato-quadrate, vertical, angled above, slightly effuse below. *Outer lip* sharp, curved. *Basal lip* sharp, produced, and somewhat flattened. *Columella* vertical, with an indistinct plait. *Inner lip* narrowly spread over the pillar, and lightly over the parietal wall. *Operculum* unknown.

Diameter, 0·82 mm.; height, 3·21 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms. One specimen.

Genus 2. Turbonilla, Risso, 1826.

Turbonilla, Risso, Hist. Eur. Mérid., Moll., iv, 1826, 224. Type: *T. typica,* D. & B. = *T. plicatula,* Risso; not *Turbo plicatulus,* Brocchi, 1814. *Chemnitzia,* d'Orbigny, 1839, not 1850. *Pyrgiscus,* Philippi, 1841. *Orthostelis,* Aradas. *Euturbonilla,* Semper, 1861.

Animal with wide tentacles, mentum elongated, flattened, usually bilobed in front; foot large, anteriorly auriculated.

Shell slender, elongated, many-whorled, generally costulate, apex sinistral; columella vertical, not plicate. Operculum horny, subspiral, the columellar margin entire, face with a spiral groove.

Distribution.—Universal.

Fossil.—Tertiary.

The species are very small and graceful; the shells usually white.

1. **Turbonilla zealandica,** Hutton, 1873. Plate 16, fig. 13.

Chemnitzia zealandica, Hutt., C.M.M., 22; J. de Conch., 1878, 24; M.N.Z.M., 72. *Turbonilla neozelanica,* Hutt., P.L.S. N.S.W., ix, 934; Plioc. M., 56, pl. 7, f. 44.

Shell small, subulate, white and shining, semitransparent, imperforate. *Sculpture* consisting of numerous, close, flattish, and somewhat flexuous axial riblets, with narrower interspaces; the riblets

are stopped below the periphery of the last whorl by a spiral thread arising from the suture. *Colour* white. *Spire* high, subulate, much higher than the aperture; outlines very little convex. *Protoconch* heterostrophe, of 1 smooth and strongly convex whorl. *Whorls* 8, regularly increasing, but slightly convex; base flatly rounded and smooth. *Suture* deep. *Aperture* subvertical, elongately oval, angled above and narrowly rounded below. *Peristome* discontinuous, thin and sharp. *Basal lip* slightly produced, sometimes effuse and sharply angular. *Columella* somewhat oblique, slightly arcuate. *Inner lip* but little reflexed, forming a very thin callosity on the parietal wall. *Operculum* unknown.

Diameter, 2·5 mm.; height, 5·75 mm. (type). Diameter, 1·5 mm.; height, 5 mm. (specimen of 8 whorls).

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Throughout New Zealand, from shallow water to 50 fathoms (the type is from Stewart Island); Snares and Bounty Islands, in 50 fathoms.

Remarks.—This species is exceedingly variable in size, approaching the Australian *T. acicularis*, A. Ad., but the costæ are more numerous and closer together. Such slender forms as 1 mm. by 3·5 mm. and 1·1 mm. by 4 mm. are met with.

Fossil.—Pliocene.

Genus 3. Odostomia, Fleming, 1813.

Odostomia, Fleming, Edinburgh Encyc., vii, 1813, 76. Type: *Turbo plicatus*, Montagu. *Odontostoma*, Turton, 1829; not of d'Orbigny, 1841. *Odontostomia*, Jeffreys, 1839. *Turritostomia*, Sacco, 1892.

Animal elongated, the head large and robust, bearing 2 conical tentacles, with eyes at their bases; foot depressed, truncated in front; mentum anteriorly bilobed.

Shell small, perforate, oval, conoidal or turriculated; columella with a feeble, oblique, more or less marked plait; aperture oval or subrhomboidal; peristome mostly discontinuous. Operculum horny, lamellar, subimbricated, with a median spiral groove, inner margin indented.

Very small, usually smooth, shells, having the habit of *Rissoæ*, and sometimes found in brackish water. The species are numerous, of universal distribution, from low water to about 700 fathoms.

Fossil from the Eocene.

Key to Subgenera.

A. Shell without axial sculpture, except growth-lines.
  a. Spiral sculpture absent, or, if present, microscopic .. Odostomia.
  aa. Spiral markings more distinct, consisting of subequal impressed lines; shell small .. .. Evalea.
B. Shell with axial sculpture.
  a. With axial ribs and a few impressed spiral lines.. .. Pyrgulina.
  aa. With spiral cords, the interspaces with faint axial threads Menestho.

Subgen. 1. Odostomia, s. str.

Shell without axial sculpture, spiral sculpture absent, or, if present, microscopical, polished; whorls not tabulated, not inflated; peritreme discontinuous. Type: *O. plicata*, Mont.

Key to Species.

A. Spire of about the same height as the aperture.
  a. With distinct dense microscopic spiral striæ .. .. *denselirata.*
  aa. With a few indistinct microscopic spirals on the body-whorl, spire scalar, last whorl very high .. .. *dolichostoma.*
  aaa. Without spiral sculpture, spire not scalar .. .. *cryptodon.*
B. Spire about 1½ times the height of the aperture, with indistinct spiral microscopic striæ, suture margined.
  a. Adult with 6 to 8 whorls, body-whorl angled, suture narrowly margined.
    b. Adult with 6 whorls; height, 4·5 mm. .. .. *stygia.*
    bb. Adult with 8 whorls; height, 7·5 mm.; spire broadly conical .. .. *bembix.*
  aa. Adult with 5 whorls, body-whorl rounded, suture broadly margined .. .. *taumakiensis.*
C. Spire about twice the height of the aperture.
  a. Without any spiral sculpture.
    b. Spire subulate.
      c. Suture impressed, narrowly margined .. *inornata.*
      cc. Suture channelled, whorls angular above the suture .. .. *pudica.*
    bb. Spire conical.
      c. Spire lightly scalar, umbilicus closed .. .. *hyphala.*
      cc. Spire not scalar, last whorl subangular, umbilicus narrow but distinctly open .. *takapunaensis.*
  aa. With a few irregular microscopic spiral striæ.
    b. Spire subulate, suture shallow .. .. .. *vestalis.*
    bb. Spire conical.
      c. Body-whorl rounded .. .. .. *Murdochi.*
      cc. Body-whorl acutely angled .. .. .. *acutangula.*
D. Spire about 2½ times the height of the aperture, with a fine groove on periphery of body-whorl .. .. .. *incidata.*
E. Spire more than three times the height of the aperture, subcylindrical, without sculpture .. .. .. *fastigiata.*

1. **Odostomia acutangula**, Suter, 1908. Plate 16, fig. 14.

Odostomia actuangula, Suter, T.N.Z.I., xl, 1907 (1908), 366, pl. 29, f. 13.

Shell minute, elevated conic, rimate, solid, polished. *Sculpture* consisting of a few microscopic spiral striæ, crossed by vertical flexuous fine growth-lines. *Colour* white. *Spire* elevated conic, about twice the height of the aperture; outlines straight. *Protoconch* heterostrophe, oblique, small and rounded, of 1 whorl. *Whorls* 5, regularly increasing, flatly convex, the last acutely angled at the periphery; base flat. *Suture* impressed between the upper whorls, channelled further down. *Aperture* subvertical, broadly oval, angled above and effuse below. *Outer lip* nearly straight, acutely rounded on meeting the basal lip, which is straight. *Columella* vertical, very little arcuate,

with a feeble and deep-seated plait above. *Inner lip* narrow. *Umbilical chink* very small. *Operculum* unknown.

Diameter, 1·4 mm. ; height, 2·7 mm.

Animal unknown.

Type in my collection.

Hab. — Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons).

Remark.—The only shell at my disposal is hardly adult.

2. **Odostomia bembix,** Suter, 1908. Plate 16, fig. 15.

Odostomia lactea, Angas: Hutton, C.M.M., 22; J. de Conch., 1878, 24; M.N.Z.M., 73; P.L.S. N.S.W., ix, 935; Plioc. M., 57, pl. 7, f. 48, not of Angas nor of Dunker. *O. Angasi*, Tryon, Index, 74, not of Tryon. *O. bembix*, Suter, T.N.Z.I., xl, 1907 (1908), 362, pl. 28, f. 6.

Shell small, ovato-conic, subperforate, slightly polished, subdiaphanous, fairly solid. *Sculpture* consisting of irregularly spaced nearly straight growth-lines, crossed by fine, sometimes very indistinct, spiral striæ. *Colour* white, occasionally tinged with yellowish or pink. *Spire* conic, about 1½ times the height of the aperture; outlines straight. *Protoconch* very small, heterostrophe, of 1 smooth whorl. *Whorls* 8 in quite adult examples, but the shells usually obtained have 6 whorls; they increase regularly, are flatly convex, and the last whorl is usually distinctly angled at the periphery, but sometimes rounded. *Suture* impressed, submargined below. *Aperture* ovate, angled above, strongly effuse below. *Outer lip* sharp, slightly convex. *Basal lip* acutely convex and expanded. *Columella* oblique, with a prominent oblique plait above, concave below. *Inner lip* broadly reflected below, spreading as a very thin callus over the parietal wall. Base with a distinct *umbilical fissure*. *Operculum* unknown.

Diameter, 3·5 mm. ; height, 7·5 mm. (type, of 8 whorls). Diameter, 3 mm. ; height, 5 mm. (specimen of 6 whorls).

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Stewart Island (type); Lyttelton Harbour, in 2 fathoms (H. S.); Akaroa Harbour, in 6 fathoms (H. S.); Blind Bay; Narrow Neck Reef, Takapuna (H. S.); near Channel Island, in 25 fathoms.

Remark.—The Australian *O. Angasi*, Tryon (= *lactea*, Ang.) is a much more slender, subulate species, which has the body-whorl rounded, never angled.

Fossil in the Pliocene.

3. **Odostomia cryptodon,** Suter, 1908. Plate 16, fig. 16.

Odostomia cryptodon, Suter, T.N.Z.I., xl, 1907 (1908), 365, pl. 29, f. 12.

Shell very small, ovate, fairly solid, imperforate, smooth, slightly shining. There is no *sculpture*, except fine oblique growth-lines.

Colour white, slightly yellowish. *Spire* conic, a little higher than the aperture; outlines but faintly convex. *Protoconch* heterostrophe, oblique, of 1 smooth and convex whorl. *Whorls* 4, regularly increasing, flatly rounded; base moderately convex. *Suture* impressed. *Aperture* a little oblique, oval, angled above, narrowly effuse below. *Outer lip* thin and sharp. *Columella* vertical, arcuate, with a small plait above, which is deep within the aperture. *Inner lip* extending a little beyond the columella, with a sharp edge, slightly broadening below; not spreading over the parietal wall. *Operculum* normal.

Diameter, 1·6 mm.; height, 3 mm.

Animal unknown.

Type in my collection.

Hab.—Te Onepoto Bay, near Lyttelton, type (T. Iredale); Queen Charlotte Sound, in 16 fathoms (Captain Bollons).

4. Odostomia denselirata, Suter, 1908. Plate 16, fig. 17.

Odostomia denselirata, Suter, T.N.Z.I., xl, 1907 (1908), 364, pl. 28, f. 9.

Shell minute, elongately oval, thin, semitransparent, slightly shining, imperforate. *Sculpture:* The protoconch and the succeeding whorl smooth, the others microscopically densely and distinctly spirally striate; growth-lines fine, vertical, and somewhat flexuous. *Colour* white. *Spire* conical, very little higher than the aperture; outlines moderately convex. *Protoconch* heterostrophe, of 2 whorls, smooth, polished, convex, nucleus lateral. *Whorls* 5, regularly increasing, flatly convex; base flat. *Suture* impressed. *Aperture* subvertical, ovate, high, angled above, narrowed and produced below. *Outer lip* regularly convex, thin and sharp. *Columella* vertical, arcuate, with a small plait above. *Inner lip* extending very little beyond the pillar, but broadening towards the base. *Operculum* unknown.

Diameter, 1·25 mm.; height, 2·5 mm.

Animal unknown.

Type in my collection.

Hab.—Near Little Barrier Island, in 20 fathoms, type (R. H. Shakespear).

5. Odostomia dolichostoma, Suter, 1908. Plate 16, fig. 18.

Odostomia dolichostoma, Suter, T.N.Z.I., xl, 1907 (1908), 365, pl. 29, f. 11.

Shell small, ovate, imperforate, faintly shining, opaque. *Sculpture* consisting of a few indistinct and distant spiral striæ on the body-whorl; growth-lines rather strong, oblique. *Colour* yellowish-white. *Epidermis* horny, very thin, easily wearing off. *Spire* conic, somewhat scalar, about the same height as the aperture; outlines almost straight. *Protoconch* of 1 smooth and polished whorl, heterostrophe, oblique. *Whorls* 4, the last very high, flatly convex, projecting out of the suture, base faintly rounded. *Suture* deep. *Aperture* vertical, pyriform, high, sharply angled above, broadly rounded and effuse below. *Outer lip*

regularly arched, a little thickened inside, sharp. *Columella* subvertical, arcuate, with a feeble plait above, placed rather deep within. *Inner lip* spreading a little beyond the pillar, having a sharp outer edge, broadening towards the base, and extending as a very thin glaze over the parietal wall. *Operculum* horny, inner margin very little indented.

Diameter, 2·1 mm.; height, 4·2 mm.

Animal unknown.

Type in my collection.

Hab.—Cheltenham Beach, near Auckland, type (H. S.).

6. **Odostomia hyphala,** Watson, 1886. Plate 16, fig. 19.

Odostomia hyphala, Watson, Chall. Rep., xv, 483, pl. 31, f. 2.

Shell strongish, oblong, broadly conical, very slightly scalar and subumbilicate, white, with a small upturned but not sinistral tip, flat-sided conical whorls, a slightly impressed suture, a rounded shortly produced base, and a largish oblong almost direct mouth. *Sculpture* none but flexuous strongish unequal lines of growth. *Colour* translucent white, with a rather dull surface. *Spire* conical, broad, nearly twice the height of the aperture. *Apex* eroded, but apparently contracting rather suddenly to a small tip, which is slightly turned over on one side. *Whorls* 7, of rapid but regular increase; they are broad, but not high; each has a slight contraction at the bottom, and above this is faintly convex and then flat-sided; at the top of the shell they project very slightly and sharply out of the suture; the last is round, with a shortly produced base. *Suture* strongish from the contraction above it and the slight projection of the whorl below. *Aperture* rather large, oblong, pointed above and at the front of the pillar. *Outer lip* thin, patulous at the base, and slightly guttered at the point of the pillar. *Columella* arcuate, with a very slight plait, which is oblique, lies deep within the mouth and close to the top of the columella. *Inner lip* a mere gloss on the body, from which it runs on continuously into the columella; here it is very thin and patulous, concealing the umbilicus. (Watson.)

Diameter, 3 mm.; height, 6·25 mm. Aperture—breadth, 1·75 mm.; height, 2·5 mm.

Animal unknown.

Type in the British Museum.

Hab.—Challenger Station 169, north-east from the East Cape, in 700 fathoms (type).

7. **Odostomia fastigiata,** Suter, 1907. Plate 16, fig. 20.

Odostomia fastigiata, Suter, T.N.Z.I., xxxix, 1906 (1907), 255, pl. 9, f. 3.

Shell small, subcylindrically acuminate, imperforate, smooth, with a distinct columellar plait. There is no *sculpture* except distinct

incremental lines. *Colour* white. *Spire* high, slowly tapering towards the small globular apex, more than three times the height of the aperture; outlines somewhat convex. *Protoconch* heterostrophe, subcentral, smooth, the apex tilted up and globular, 1 whorl. *Whorls* 7, first slowly increasing, the last about half the length of the whole shell; base narrowly rounded. *Suture* distinct, but superficial. *Aperture* vertical, ovate, truncated above by the parietal wall. *Outer lip* very little curved, broken off. *Basal lip* narrowly convex. *Columella* with a distinct blunt plait above, slightly concave below. *Operculum* unknown.

Diameter, 1·5 mm.; height, 4·5 mm.

Animal unknown.

Type in the Dominion Museum.

Hab.—Near Channel Island, Hauraki Gulf, in 25 fathoms (type).

8. **Odostomia incidata,** Suter, 1908. Plate 16, fig. 21.

Odostomia incidata, Suter, T.N.Z.I., xl, 1907 (1908), 348, pl. 27, f. 6.

Shell small, subulate, narrowly subperforate, with a fine groove on the periphery of the body-whorl, fairly solid, polished. *Sculpture* consisting of excessively fine dense microscopic spiral lines; on the third whorl a very fine groove appears above and close to the suture, a little more distant and better marked on the next volution, and continued on the periphery of the last whorl; growth-lines vertical, fine, but distinct. *Colour* white. *Spire* elevated conical, about $2\frac{1}{2}$ times the height of the aperture; outlines almost straight. *Protoconch* small, heterostrophe, tilted at a right angle to the axis, of 1 whorl, smooth and shining. *Whorls* 6, regularly increasing, slightly shouldered and convex; base rounded. *Suture* channelled, lightly margined below. *Aperture* oblique, oval, angled above and effuse below. *Outer lip* moderately convex, thin, and sharp. *Columella* short, strongly arcuate, with a very strong plait above. *Inner lip* very narrow. *Umbilical chink* a mere fissure. *Operculum* unknown.

Diameter, 1·8 mm.; height, 4·5 mm.

Animal unknown.

Type in my collection.

Hab.—Five miles south of Cuvier Island, in 38 fathoms, type (Captain Bollons); dredged off Otago Heads (A. Hamilton).

9. **Odostomia inornata,** Suter, 1908. Plate 16, fig. 22.

Odostomia inornata, Suter, T.N.Z.I., xl, 1907 (1908), 364, pl. 28, f. 8.

Shell small, subulate, imperforate, fairly solid, lightly polished, smooth. *Sculpture* consisting of straight and fine growth-lines only. *Colour* white. *Spire* broadly subulate, twice the height of the aperture; outlines straight. *Protoconch* heterostrophe, oblique, globular,

of 1 whorl, smooth. *Whorls* 6, regularly increasing, the last rather high, but slightly convex, body-whorl sometimes faintly angled at the periphery; base flat. *Suture* impressed, narrowly and rather indistinctly margined below. *Aperture* subvertical, narrowly pyriform, rounded and produced below. *Outer lip* slightly convex, sharp. *Columella* somewhat oblique, arcuate, with a distinct oblique and deeply placed plait above. *Inner lip* narrow above, but broadening towards the base, spread as a thin callus over the parietal wall. Sometimes there is a very narrow *umbilical chink* present. *Operculum* unknown.

Diameter, 2·5 mm.; height, 6·1 mm.

Animal unknown.

Type in my collection.

Hab.—Near the Snares (type) and Bounty Islands, in 50 fathoms (Captain Bollons).

Remark.—This species is apparently nearly allied to *O. hyphala*, but the whorls are not slightly scalar, the suture is less deep, the columellar plait stronger, &c.

10. Odostomia stygia, n. nov. Plate 16, fig. 23.

Odostomia marginata, M. & S., T.N.Z.I., xxxviii, 1905 (1906), 296, pl. 25, f. 37; not of C. B. Adams. 1852.

Shell small, ovate, white and shining, almost smooth, with a margined suture and angled body-whorl. *Sculpture* consists of distinct flexuous growth-lines, irregularly spaced, and with much finer incremental striæ between them; with a magnifying-power of about 30 diameters distant fine spiral striation can be made out. *Colour* white; fresh specimens semitransparent, but dead shells porcellanous. *Spire* elevated, conical, 1½ times the height of the aperture; outlines very slightly convex. *Protoconch* heterostrophe, of 2 smooth tilted whorls, nucleus lateral. *Whorls* 6, flatly convex, the last angled at the periphery, rather rapidly but regularly increasing; base convex. *Suture* impressed, distinctly margined below. *Aperture* pyriform, angled above, rounded and slightly effuse below. *Peritreme* discontinuous. *Outer lip* sharp, flatly convex, acutely rounded at the base. *Columella* with a very distinct plait just below the junction with the parietal wall, concave below. *Umbilicus* represented by a distinct chink. *Operculum* unknown.

Diameter, 2·3 mm.; height, 4·5 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms (type); dredged off Otago Heads (A. Hamilton); near Channel Island, Hauraki Gulf, in 25 fathoms; Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons); Banks Peninsula (Iredale).

11. Odostomia Murdochi, n. nov. Plate 16, fig. 24.

Odostomia proxima, Murdoch, T.N.Z.I., xxxvii, 1904 (1905), 226, pl. 8, f. 19; not of de Folin, 1872.

Shell small, elongated, rather fragile, smooth. *Sculpture* consisting of irregular minute growth-periods, in places slightly pronounced, usually more marked on the spire; these are crossed by minute spiral striæ and scratches, very irregularly spaced, in some almost absent except for a few on the anterior half of the last whorl. *Colour* white or lightly yellowish, polished. *Spire* high, conical, not quite twice the height of the aperture; outlines straight. *Protoconch* heterostrophe, minute, polished, the nucleus lateral. *Whorls* 6, somewhat rounded; base convex. *Suture* deep, not channelled, very similar to that of *O. hyphala;* margined below by a narrow smooth band. *Aperture* small, ovate, oblique, angled above, slightly effuse below. *Columella* vertical, slightly arcuate. *Inner lip* slightly reflected, and spreading over the parietal wall; base narrowly perforate. *Operculum* unknown.

Diameter, 1·8 mm.; height, 3·9 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Whangaroa Harbour, type (C. Traill); Banks Peninsula (Iredale).

12. Odostomia pudica, Suter, 1908. Plate 17, fig. 1.

Odostomia pudica, Suter, T.N.Z.I., xl, 1907 (1908), 366, pl. 29, f. 14.

Shell small, elongate, imperforate, smooth, semitransparent, polished. There is no *sculpture*, except fine straight growth-lines. *Colour* white. *Spire* subulate, twice the height of the aperture; outlines straight. *Protoconch* of 1 small and smooth whorl, heterostrophe, oblique. *Whorls* 7, regularly increasing, flat, the lower ones angularly contracted above the suture, the angle continued on the periphery of the body-whorl; base flat. *Suture* canaliculate. *Aperture* oblique, pyriform, angled above and narrowly produced below. *Outer lip* flatly rounded, thin and sharp. *Columella* vertical, slightly concave, with a low oblique plait above. *Inner lip* rather broadly expanded, spreading thinly over the parietal wall. *Operculum* unknown.

Diameter, 2·4 mm.; height, 5·6 mm.

Animal unknown.

Type in my collection.

Hab.—Bay of Islands, type (J. C. Anderson).

Remark.—This species is evidently near *O. hyphala*, but it is shorter by the same number of whorls, and slightly more slender; the whorls are angled above the suture, and the last whorl is slightly angled at the periphery; the suture is channelled, and the whorls not projecting below it.

13. **Odostomia takapunaensis,** Suter, 1908. Plate 17, fig. 2.

Odostomia takapunaensis, Suter, T.N.Z.I., xl, 1907 (1908), 365, pl. 28, f. 10.

Shell small, conical, narrowly umbilicate, smooth, fairly solid, shining. There is no *sculpture*. *Colour* white. *Spire* conic, about twice the height of the aperture; outlines straight. *Protoconch* heterostrophe, of 2 oblique whorls, nucleus lateral. *Whorls* 7, regularly increasing, flatly convex, the last angularly rounded at the periphery; base flat. *Suture* impressed. *Aperture* subvertical, oval, broadly angled above, effuse below. *Outer lip* slightly arcuate, sharp. *Columella* subvertical, arcuate, with a distinct oblique plait above. *Inner lip* narrow, broadening a little below, thin over the parietal wall. *Umbilicus* narrow, but very distinct and quite open. *Operculum* unknown.

Diameter, 2·2 mm.; height, 4 mm.

Animal unknown.

Type in my collection.

Hab.—Takapuna Reef, in sand; type (H. S.).

14. **Odostomia taumakiensis,** Suter, 1908. Plate 17, fig. 3.

Odostomia taumakiensis, Suter, T.N.Z.I., xl, 1907 (1908), 363, pl. 28, f. 7.

Shell very small, elongately ovate, imperforate, smooth and polished, thin, translucent. *Sculpture* consisting occasionally of a few microscopic indistinct spiral striæ on the body-whorl, but very often absent; growth-lines fine, oblique. *Colour* white. *Spire* elevated conic, about $1\frac{1}{2}$ times the height of the aperture; outlines somewhat convex. *Protoconch* minute, heterostrophe, but slightly tilted, of 1 smooth whorl, globular. *Whorls* 5, regularly increasing, lightly convex; base flatly rounded. *Suture* impressed, margined below by a rather broad band. *Aperture* subvertical, oval, angled above, rounded and effuse below. *Outer lip* thin and sharp. *Columella* slightly oblique, arcuate, with a deeply situated and not very prominent plait above. *Inner lip* but slightly expanded, forming a very thin and shining layer on the parietal wall. *Operculum* unknown.

Diameter, 1·5 mm.; height, 3·2 mm.

Animal unknown.

Type in my collection.

Hab.—Taumaki Island, west coast of the South Island, in 10 fathoms (type); near the Snares and Bounty Islands, in 50 fathoms (Captain Bollons).

Remarks.—From *O. Murdochi* this species is distinguished by being imperforate, having very faint or no spiral sculpture, the suture margined, and only 5 whorls; from *O. stygia* by the same characters, except the margined suture, and the body-whorl not being angled.

15. **Odostomia vestalis,** Murdoch, 1905. Plate 17, fig. 4.

Odostomia vestalis, Murdoch, T.N.Z.I., xxxvii, 1904 (1905), 227, pl. 8, f. 20.

Shell small, slender, smooth, polished, and having a somewhat loosely coiled appearance. *Sculptured* with minute irregular growth-lines, crossed by irregular microscopic striæ, the latter only indicated here and there. *Colour* white. *Spire* subulate, about twice the height of the aperture, sometimes a little more; outlines faintly convex. *Protoconch* heterostrophe, globular, slightly obliquely tilted, nucleus lateral. *Whorls* 6, rapidly but regularly increasing, lightly convex; base flatly rounded. *Suture* impressed, shallow, and lightly submargined. *Aperture* pyriform, narrowed and effuse below. *Outer lip* thin, sharp. *Columella* arcuate, with a small oblique plait, rather deep within the aperture. *Inner lip* lightly reflected, and spreading thinly over the parietal wall. *Umbilicus* closed. *Operculum* unknown.

Diameter, 1·6 mm.; height, 4·3 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Whangaroa Harbour, type (C. Traill); near Channel Island, Hauraki Gulf, in 25 fathoms; Banks Peninsula (Iredale).

Subgen. 2. Evalea, A. Adams, 1860.

Evalea, A. Ad., A.M.N.H., vi, 1860, 22, 417. Type: *E. elegans*, A. Ad. *Ondina*, Folin, 1870. *Auriculina*, Gray, 1847. *Ptychostomon*, Locard, 1886.

Shell with the axial ribs absent, represented by lines of growth only, with spiral markings consisting of many usually subequally and universally distributed impressed lines.

Key to Species.

A. Spire about twice the height of the aperture, whorls conspicuously spirally lirate .. .. *liricincta.*
B. Spire about 1½ times the height of the aperture, spiral sculpture not conspicuous.
a. With numerous flat spiral threads, suture superficial.. .. *impolita.*
aa. With fine microscopic spiral striæ and a few more prominent spiral cords on the body-whorl, suture deep .. .. *chordata.*

16. **Odostomia chordata,** Suter, 1908. Plate 17, fig. 5.

Odostomia (*Evalea*) *chordata*, Suter, T.N.Z.I., xl, 1907 (1908), 348, pl. 27, f. 5.

Shell small, elongate-ovate, subperforate, slightly scalar, rather thin, polished. *Sculpture* consisting of very fine and close microscopic striæ, and in addition a few subequidistant flat spiral cords, distinct only on the body-whorl; their number is about 9, and those on the middle of the whorl are less conspicuous; the growth-lines are vertical, close and fine, but some are more prominent. *Colour* white. *Spire* elevated conic, about 1½ times the height of the aper-

ture ; outlines straight. *Protoconch* small, heterostrophe, of 1 upright whorl, smooth and shining. *Whorls* 6, regularly increasing, flatly convex, somewhat contracted below at the suture, and slightly projecting above out from the suture ; base flat. *Suture* deep, narrowly margined below. *Aperture* oblique, pyriform, slightly and broadly effuse below. *Outer lip* thin and sharp. *Columella* vertical, strongly arcuate, with a moderate plait above, situate rather deep within the aperture. *Inner lip* very narrow, spreading as a very thin callous layer over the parietal wall. *Umbilical fissure* narrow. *Operculum* unknown.

Diameter, 1·9 mm. ; height, 3·8 mm.

Animal unknown.

Type in my collection.

Hab.—Five miles south of Cuvier Island, in 38 fathoms, type (Captain Bollons).

17. Odostomia impolita, Hutton, 1873. Plate 17, fig. 6.

Rissoa impolita, Hutt., C.M.M., 29 ; J. de Conch., 1878, 28 ; P.L.S. N.S.W., ix, 941. *Barleeia impolita*, Hutt., M.N.Z.M., 81 ; Suter, P. Mal. S., iii, 7. *Odontostoma impolita*, Hutt., Index, 74. *Odostomia impolita*, Hutt. : Murdoch, T.N.Z.I., xxxvii, 226, pl. 8, f. 18.

Shell very small, ovato-conic, solid, slightly polished, imperforate. *Sculpture* consisting of numerous flat and rather broad spiral threads, with much narrower interspaces ; growth-lines oblique and very fine. *Colour* white, with a yellowish tinge, more distinct on the upper whorls. *Spire* conic, about 1½ times the height of the aperture ; outlines almost straight. *Protoconch* minute, slightly heterostrophe, of 1 smooth whorl. *Whorls* 5, regularly increasing, slightly convex ; base flattish. *Suture* linear, not much impressed, margined below by one of the spirals. *Aperture* subvertical, oval, angled above and effuse below. *Outer lip* moderately convex, fairly strong and sharp. *Columella* vertical, with a small plait above, concave below. *Inner lip* sometimes broadly expanded beyond the pillar, and produced below to a point. *Operculum* brown, horny.

Diameter, 1·5 mm. ; height, 2·5 mm. (type, of 4 whorls). Diameter, 2·2 mm. ; height, 4·2 mm. (specimen of 5 whorls).

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Stewart Island (type) ; Foveaux Strait, in 15 fathoms ; Taumaki Island, west coast of the South Island, in 10 fathoms (Captain Bollons) ; Banks Peninsula (Iredale).

18. Odostomia liricincta, Suter, 1908. Plate 17, fig. 7.

Odostomia (*Evalea*) *liricincta*, Suter, T.N.Z.I., xl, 1907 (1908), 367, pl. 29, f. 16.

Shell very small, elongate-oval, imperforate, spirally lirate, slightly shining. *Sculpture* consisting of unequal flat spiral liræ, absent on

the first two whorls, the interstices linear, the sculpture extending over the base ; growth-lines dense, oblique, distinct. *Colour* white. *Spire* elevated conic, about twice the height of the aperture ; outlines straight. *Protoconch* minute, heterostrophe, globular. *Whorls* 5, regularly increasing, flatly convex, the last not angled ; base flattish. *Suture* impressed. *Aperture* slightly oblique, angled above and narrowly produced below. *Outer lip* regularly rounded, thin and sharp. *Columella* subvertical, almost straight, with a minute plait above. *Inner lip* extending a short distance beyond the pillar, and as a thin layer over the parietal wall. *Operculum* unknown.

Diameter, 1·5 mm. ; height, 3·3 mm.

Animal unknown.

Type in my collection.

Hab.—Port Pegasus, Stewart Island, in 18 fathoms, type (Captain Bollons).

Remarks.—This species is nearest allied to *O. impolita*, but it is a smaller and more slender shell, and the spiral sculpture is much more distinct. The fossil *O. fasciata*, Hutt. = *Huttoni*, Sut., is also very similar, but has a differently arranged sculpture and an open umbilicus.

Subgen. 3. PYRGULINA, A. Adams, 1863.

Pyrgulina, A. Ad., J.L.S., vii, 1863, 4. Type: *Chrysallida casta*, A. Adams. *Parthenia*, Lowe, 1840 (in part). *Nœmia*, Folin, 1870. *Parthenina*, Bucq., Dollf., Dautzenb., 1883.

Shell with axial ribs, the post-nuclear whorls sculptured similarly throughout ; spiral markings consisting of impressed lines, subequally spaced, present between the sutures and the base of the whorls.

19. Odostomia rugata, Hutton, 1886. Plate 17, fig. 8.

Odostomia (*Parthenia*) *plicata*, Hutt., T.N.Z.I., xvii, 1884 (1885), 319, pl. 18, f. 17 ; not of Montfort, 1810. *O. rugata*, Hutt., T.N.Z.I., xviii, 1885 (1886), 353 ; Plioc. M., 58, pl. 7, f. 51. *O.* (*Pyrgulina*) *rugata*, Hutt. : Murdoch, T.N.Z.I., xxxvii, 227.

Shell small, ovato-elongated, imperforate, rather solid, somewhat shining, axially plicated. *Sculpture* consisting of numerous oblique flatly rounded axial riblets, usually stopped by a spiral thread below the periphery of the last whorl, but very often extending over the base ; the riblets on the last volution sometimes, though rarely, almost vertical ; interstices of about the same width as the riblets, and adorned with minute dense spiral striæ ; the riblets number about 18 on the body-whorl. *Colour* white. *Spire* elevated conical, about twice the height of the aperture ; outlines almost straight. *Protoconch* minute, of 1 smooth whorl, heterostrophe, nucleus lateral. *Whorls* 6, regularly increasing, flatly rounded ; base convex. *Suture* impressed and slightly margined. *Aperture* subvertical, ovate, angled above, slightly

effuse below. *Outer lip* solid, sharp, somewhat convex. *Columella* vertical, with a rather strong plait above, slightly convex below. *Inner lip* rather broad and strong, angularly produced below, and forming a distinct callosity over the parietal wall. *Operculum* unknown.

Diameter, 1·8 mm.; height, 3·7 mm. (specimen of 6 whorls).

Animal unknown.

Type, from the Pliocene, in the Canterbury Museum, Christchurch.

Hab.—Whangaroa Harbour (C. Traill); Hohoura Bay (R. Buddle); Takapuna (H. S.); near Little Barrier Island, in 20 fathoms (R. H. Shakespear); Cook Strait; Queen Charlotte Sound, in 16 fathoms; Taumaki Island, in 10 fathoms; Stewart Island, in 18 fathoms; Snares and Bounty Islands, in 50 fathoms (Captain Bollons); Banks Peninsula (Iredale).

Fossil.—Miocene and Pliocene.

Subgen. 4. Menestho, Möller, 1842.

Menestho, Möller, Ind. Moll. Groenl., 1842, 10. Type: *Turbo albulus*, Fabr.
Pyramis, Couthouy, 1839; not of Schumacher, 1817.

Shell having moderately well-developed spiral cords, usually equally spaced, and present between the sutures and on the base; axial ribs indicated by faint threads between the spiral sculpture; not umbilicated.

20. Odostomia sabulosa, Suter, 1908. Plate 17, fig. 9.

Odostomia (*Menestho*) *sabulosa*, Suter, T.N.Z.I., xl, 1907 (1908), 367, pl. 29, f. 15.

Shell small, elevated, spirally striate, thin, faintly shining, imperforate. *Sculpture* consisting of flattish spiral cords, 7 on the penultimate whorl, and extending over the base; interstices slightly narrower than the cords, ornamented with numerous equidistant axial threads. *Colour* white. *Spire* narrowly conic, twice the height of the aperture; outlines straight. *Protoconch* heterostrophe, of 1 whorl, smooth, globular. *Whorls* 6, regularly increasing, but faintly convex; base flattish. *Suture* canaliculate, but not very deep. *Aperture* subvertical, oval, angled above, narrowly rounded and effuse below. *Outer lip* slightly convex. *Columella* vertical, almost straight, the columellar plait small and deep within the aperture. *Inner lip* narrow, not reflexed, forming a very thin glaze on the parietal wall. *Operculum* unknown.

Diameter, 1·8 mm.; height, 4·2 mm.

Animal unknown.

Type in my collection.

Hab.—Near the Bounty (type) and Snares Islands, in 50 fathoms (Captain Bollons).

Remarks.—The axial sculpture is in the majority of the dredged and more or less worn specimens almost completely lost. The species is more slender than *O. impolita*, the spiral cords more distinct and mostly with wider interspaces, and the latter are, in well-preserved examples, reticulated by axial threads.

Fam. **EULIMIDÆ**, Adams.

Animal with slender subulate tentacles and eyes sessile at their outer bases; proboscis retractile, invaginate, when extended very long; mouth without jaw or radula; foot elongated, produced in front; mantle with anterior rudimentary siphonal fold.

Shell small, generally elongated, subulate or turriculated, shining, polished, with spire usually curved or distorted; aperture oval, pyriform, entire, with simple lip, the columellar margin more or less thickened. Operculum corneous, paucispiral, sometimes absent.

But little is known of the animals of these little shells; it is probable that the sexes are separated. They creep with the foot much in advance of the head, which is usually concealed within the aperture of the shell, the tentacles only protruding. They are more or less parasitic on sea-urchins, holothurians, &c.

Genus 1. Eulima, Risso, 1826.

Eulima, Risso, Hist. Nat. Eur. Mérid., iv, 1826, 123. Type: *E. elegantissima*, Montag. *Parithea*, Lea, 1833 (in part). *Balcis*, Leach, 1847.

Animal having the body smooth, not ciliated, tentacles subulate, approaching at the base; eyes very large, nearly sessile, above and slightly on the outside of their bases; mantle not reflected outside, and forming a siphonal fold; foot lanceolate, grooved, truncated in front, mentum bilobed; verge small, flattened, falciform; opercular lobe winged on each side; branchial plume single.

Shell not umbilicate, subulate, composed of many whorls, polished, porcellanous; commonly the spire is slightly twisted to one side; varices not well marked externally, but forming small ribs inside the whorls, marking the position of successive mouths; aperture ovate, entire, angulate posteriorly and rounded in front; columellar border reflected. Operculum corneous, paucispiral, the nucleus near the inner lip.

The species inhabit tropical and temperate seas.

The genus is known from all the Secondary strata, and became abundant during the Tertiary period.

Key to Subgenera.

A.	Shell subulate or subcylindrical, white, spire straight or curved	Eulima.
B.	Shell subulately turriculated, often with spiral coloured bands, varices on each side of spire more or less conspicuous ..	Leiostraca.
C.	Shell subulate, often coloured, with mucronate apex ..	Mucronalia.

Subgen. 1. Eulima, s. str.

Key to Species.

A. Height of spire about three times that of the aperture.
  a. Spire straight, apex sharp .. .. *vegrandis*.
  aa. Spire lightly curved, apex blunt .. .. .. *titahica*.
B. Height of spire about twice that of the aperture.
  a. Sculptured with minute spiral incisions, body-whorl angulate *infrapatula*.
  aa. No spiral sculpture.
    b. Spire curved.
      c. Curved to the right .. .. *Treadwelli*.
      cc. Curved forwards .. .. *aucklandica*.
    bb. Spire straight.
      c. Shell subcylindrical, apex blunt.
        d. Aperture pyriform, columella not truncated .. *paxillus*.
        dd. Aperture lanceolar, columella truncated .. *truncata*.
      cc. Shell subulate, apex very sharp, aperture lanceolar, columella pointed below .. .. .. *oxyacme*.

1. **Eulima aucklandica**, Suter, 1909. Plate 17, fig. 10.

Eulima aucklandica, Suter, Subantarct. Islds. N.Z., i, 1909, 24, pl. 1, f. 3.

Shell small, subulate, lightly curved forwards, white, smooth, glossy. There is no *sculpture*, except very fine growth-lines and rather inconspicuous discontinuous varices. *Colour* white, the red remains of the animal shining through the upper whorls. *Spire* lightly curved forwards, about twice the height of the aperture. *Protoconch* globular. *Whorls* 8, gradually increasing, but faintly convex, the last slightly flattened below the suture, convex at periphery and base. *Suture* superficial, white-banded below. *Aperture* pyriform, subvertical, angled above, regularly arched and somewhat effuse below. *Peristome* sharp, simple, the outer lip very little convex, slightly advancing at the middle. *Columella* subvertical, arcuate. *Inner lip* narrow, callous. There is a very slight *umbilical depression*. *Operculum* unknown.

Diameter—Maj., 2·4 mm.; min., 2 mm.: height, 6·4 mm.

Type in the Canterbury Museum, Christchurch.

Hab.—Carnley Harbour, Auckland Islands, on shore (Professor Benham).

2. **Eulima infrapatula**, Murdoch and Suter, 1906. Plate 17, fig. 11.

Eulima infrapatula, M. & S., T.N.Z.I., xxxviii, 1905 (1906), 297, pl. 25, f. 42.

Shell small, subulate, broadened at the base which is distinctly angulate, tapering to a sharp slender apex which is slightly curved, thin, smooth, polished. *Sculpture* consists of minute spiral incisions, scarcely noticeable or absent except upon the last whorl. *Colour* white. *Spire* narrowly conical, tapering rapidly to a subacicular apex which is oblique and somewhat distorted; about twice the height of the aperture; outlines straight. *Protoconch* of a few smooth

convex whorls, nucleus minute, rounded. *Whorls* 9, lightly convex and contracted at the suture, the first four whorls more rounded than the others ; varices few, interrupted, irregularly disposed, and not well marked ; base rounded. *Suture* very distinct, impressed. *Aperture* subvertical, rather large, obliquely quadrate, broadly angled above, flatly expanded at the base. *Outer lip* not much strengthened, but slightly curved, and forming a broad rounded angle at the junction with the basal lip. *Columella* stout, nearly straight, rounded on joining the basal lip, both being distinctly everted. *Inner lip* broadly reflexed over the pillar, and forming a thin callus on the parietal wall. *Operculum* unknown.

Diameter, 2·1 mm. ; height, 5 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms (type).

Remark.—This species is allied to the Australian *E. munita*, Hedley, from which it may be distinguished by its smaller size, fewer whorls, the less prominent varices, and more feeble sculpture.

3. Eulima oxyacme, Suter, 1908. Plate 17, fig. 12.

Eulima oxyacme, Suter, T.N.Z.I., xl, 1907 (1908), 349, pl. 27, f. 7.

Shell small, subulate, sharply pointed, pellucid, polished, straight, thin and fragile. *Sculpture* formed by very fine straight growth-lines only. *Colour* white. *Spire* elevated conic, with a sharp apex, not quite twice the height of the aperture ; outlines perfectly straight. *Protoconch*, minute, globose. *Whorls* 8, regularly increasing, flat, the last high ; base flattish. *Suture* linear, superficial, false-margined below. *Aperture* subvertical, lanceolar, high and narrow, narrowly angled above, acuminate below. *Outer lip* slightly convex, very thin and sharp. *Basal lip* very narrowly rounded and a little produced. *Columella* vertical, straight, narrowed to a point below ; parietal wall concave below, convex above. *Operculum* unknown.

Diameter, 1·8 mm. ; height, 5·1 mm.

Animal unknown.

Type in my collection.

Hab.—Five miles south of Cuvier Island, in 38 fathoms, type (Captain Bollons).

4. Eulima paxillus, Hedley, 1904. Plate 17, fig. 13.

Eulima paxillus, Hedley, Rec. A.M., v, 1904, 96, f. 24 in text.

Shell very small, short, straight, subcylindrical, thin, semitransparent. There is no *sculpture*, except fine discontinuous varices. The shell is *colourless*. *Spire* subcylindrical, with a blunt apex, about twice the height of the aperture ; outlines straight. *Protoconch* minute, broadly rounded. *Whorls* 6, flattened, regularly increasing ;

base flattish. *Suture* linear, slightly impressed; false-margined—*i.e.*, the base of each whorl seen indistinctly through the substance of the next appears as an impressed line beneath the suture. *Aperture* pyriform, acutely angled above. *Outer lip* curved, thin and sharp, its insertion high up. *Columella* subvertical, arcuate. *Inner lip* spreading rather broadly beyond the pillar. *Operculum* unknown.

Diameter, 0·86 mm.; height, 2·9 mm.

Animal unknown.

Type in the Australian Museum, Sydney.

Hab.—Foveaux Strait, type (A. Hamilton).

5. **Eulima titahica**, Suter, 1908. Plate 17, fig. 14.

Eulima titahica, Suter, T.N.Z.I., xl, 1907 (1908), 368, pl. 29, f. 18.

Shell small, subulate, slightly curved, semitransparent, polished with a few discontinuous and inconspicuous varices. *Sculpture* consisting of a few indistinct varices and faint growth-lines. *Colour* white. *Spire* somewhat curved to the right, narrowly conic, three times the height of the aperture. *Protoconch* globular, obtuse. *Whorls* 7, regularly increasing, flatly convex; base rounded. *Suture* linear, not much impressed, false-margined below. *Aperture* pyriform, angled above, slightly effuse below. *Outer lip* but slightly curved, thin and sharp. *Basal lip* broadly convex. *Columella* vertical, indistinctly arcuate; parietal wall straight. *Inner lip* very little expanded, with a sharp edge. *Operculum* unknown.

Diameter, 1·4 mm.; height, 4 mm.

Animal unknown.

Type in my collection.

Hab.—Titahi Bay, Cook Strait; type (Miss Mestayer).

6. **Eulima Treadwelli**, Hutton, 1893. Plate 17, fig. 15.

Eulima micans, Hutt., T.N.Z.I., xvii, 1884 (1885), 318; not of Carpenter, nor T.-Woods. *E. Treadwelli*, Hutton, Plioc. M., 55, pl. 7, f. 42; Suter, T.N.Z.I., xxxviii, 324.

Shell small, subulate, slightly curved to the right, white and polished, translucent. *Sculpture:* None. *Colour* white, the upper whorls sometimes yellowish. *Spire* curved, high conical, a little more than twice the height of the aperture. *Protoconch* small, globose. *Whorls* 8, regularly increasing, rather high, flat; base flatly rounded. *Suture* linear, superficial. *Aperture* pyriform, angled above and rounded below. *Outer lip* almost straight, thin and sharp. *Columella* subvertical, a little arcuate. *Inner lip* slightly reflexed beyond the upper part, and spreading as a thin layer over the flat parietal wall. *Operculum* unknown.

Diameter, 2 mm.; height, 6 mm.

Animal unknown.

Type, from the Pliocene, in the Canterbury Museum, Christchurch.

Hab.—Near Stewart Island, in about 15 fathoms (A. Hamilton); near the Snares, in 50 fathoms (Captain Bollons).

Remark.—The type has a height of 4 mm., and 6 whorls only.

Fossil in the Pliocene.

7. Eulima truncata, Suter, 1908. Plate 17, fig. 16.

Eulima truncata, Suter, T.N.Z.I., xl, 1907 (1908), 368, pl. 29, f. 17.

Shell very small, subcylindrical, thin and polished, semitransparent, straight. There is no *sculpture* and no varices. *Colour* white. *Spire* very narrowly conic, a little more than twice the height of the aperture; outlines straight. *Protoconch* high, obtusely rounded. *Whorls* 5, regularly increasing, flat; base flattish, elongated. *Suture* linear, superficial, false-margined below. *Aperture* subvertical, lanceolar, high and narrow, sharply angled above and acuminate below. *Outer lip* straight above, rounded towards the base, thin and sharp. *Columella* short, truncated at the base; parietal wall slightly concave. *Operculum* unknown.

Diameter, 1 mm.; height, 3 mm.

Animal unknown.

Type in my collection.

Hab.—Cape Maria van Diemen, type (Captain Bollons).

Remark.—The specimen, of 5 whorls only, is no doubt not quite full grown.

8. Eulima vegrandis, Murdoch and Suter, 1906. Plate 17, fig. 17.

Eulima vegrandis, M. & S., T.N.Z.I., xxxviii, 1905 (1906), 297, pl. 25, f. 40, 41.

Shell small, subulate, straight, smooth and glossy. *Sculpture* absent, except an occasional interrupted varix. *Colour* white, porcellanous. *Spire* straight, about three times the height of the aperture; outlines straight. *Protoconch* of about 2 smooth whorls, very slightly curved from the axis of the shell, nucleus minute, rounded. *Whorls* 11, with straight sides, the last indistinctly angled at the periphery; base convex. *Suture* linear, false-margined between the lower whorls. *Aperture* slightly oblique, pyriform, angled above, rounded and a little effuse at the base. *Outer lip* lightly curved and thickened, feebly sinuated below the insertion. *Columella* short, arcuate. *Inner lip* reflected and united with the basal lip, spread narrowly as a distinct callus over the parietal wall. *Operculum* unknown.

Diameter, 1·9 mm.; height, 6·9 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms (type).

Subgen. 2. Leiostraca, H. and A. Adams, 1854.

Leiostraca, H. & A. Ad., in Sowerby's Thes. Conch., ii, 15, 1854. Type: *Eulima subulata*, Donovan. *Subularia*, Monterosato, 1884.

Shell subulately turriculated; whorls flattened, smooth, polished, often ornamented with spiral coloured bands; a succession of slight varices on each side of the spire, not always apparent; aperture oblong, narrow, entire; inner lip thickened, a little sinuous in the middle; outer lip sharp, flexuous.

9. Eulima Murdochi, Hedley, 1904. Plate 17, fig. 18.

Leiostraca Murdochi, Hedley, Rec. A.M., v, 1904, 97, f. 25 in text.

Shell small, subcylindrical, with blunt ends, thin, translucent, glossy. *Sculpture* none, and no varices are apparent. *Colour* pale brown below, darkening to chocolate above; on the last whorl is a broad peripheral and a narrow subsutural colourless band, the latter of which also reappears on the penultimate, and is overlined by a chocolate thread; the peristome and a patch on the centre of the base are also chocolate; the apex is colourless. *Spire* subcylindrical, twice the height of the aperture; outlines straight. *Protoconch* minute, broadly convex. *Whorls* 5, slightly tapering, the last exceeding the rest; base flattened, the umbilical region impressed, not perforate. *Suture* linear, false-margined below. *Aperture* oval, everted anteriorly. *Peristome* a little thickened and expanded. *Columella* slightly oblique, straight. *Inner lip* narrow, forming a thin callus on the parietal wall. *Operculum* unknown.

Diameter, 0·9 mm.; height, 2·6 mm.

Animal unknown.

Type in the Australian Museum, Sydney.

Hab.—Foveaux Strait and Lyall Bay, type (A. Hamilton).

Subgen. 3. Mucronalia, A. Adams, 1862.

Mucronalia, A. Ad., A.M.N.H., ix, 1862, 295. Type: *M. exilis*, A. Adams.

Shell subulate, straight, often coloured, pupoidal, with mucronate apex; aperture oval-oblong.

10. Eulima bulbula, Murdoch and Suter, 1906. Plate 17, fig. 19.

Eulima (*Mucronalia*) *bulbula*, M. & S., T.N.Z.I., xxxviii, 1905 (1906), 298, pl. 25, f. 43, 44.

Shell small, subulate, white, smooth and polished. *Sculpture* consists only of the mostly discontinuous slightly marked varices on some of the whorls. *Colour* white, porcellanous. *Spire* long, subulate, straight, about $3\frac{1}{2}$ times the height of the aperture; outlines straight. *Protoconch* mucronate, the nucleus small, rounded,

the second whorl relatively much enlarged, bulbous; all smooth. *Whorls* 10, regularly increasing, flat, the last slightly angled at the periphery. *Suture* distinct, not impressed, irregularly indented on the lower part of the shell. *Aperture* small, vertical, pyriform, regularly arched below. *Outer lip* sharp, very slightly convex. *Columella* short, arcuate. *Inner lip* forming a slight callosity on the pillar and parietal wall, rounded off at the base toward the basal lip. *Operculum* unknown.

Diameter, 3 mm.; height, 13 mm. Aperture—breadth, 1·5 mm.; height, 3 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms (type).

Remark.—The mucronate tip of this species somewhat recalls *E. Coxi*, Pilsbry. (C. Hedley.)

Tribe 2. HETEROPODA.

These are free-swimming *Tænioglossa*, with the foot flattened laterally and the otocysts situated near the cerebral ganglia. There are no mandibles, and the intestine is short. All the *Heteropoda* are pelagic, and are much modified in adaptation to this mode of existence. The foot is very large, and has the form of a fin compressed bilaterally; it bears, in the male at least, a sucker at its ventral aspect. The visceral sac or "nucleus" and mantle form a progressively smaller and smaller part of the mass of the body, but the head always remains large, and forms a cylindrical snout. The eyes are very large and highly differentiated in structure; they are placed at the sides of the cerebral ganglia and at the bases of the tentacles when the latter organs exist. The alimentary canal is furnished with a protractile pharynx containing a characteristic tænioglossate radula, with very powerful lateral and marginal teeth.

They are transparent, and are generally found in dense bands in warm and temperate zones, swimming slowly in a reversed position—that is to say, with the foot uppermost. They are all carnivorous.

Fam. **ATLANTIDÆ**, Rang.

Visceral sac and shell spirally coiled in one plane; foot divided transversely into two parts, the posterior part bearing an operculum with a sinistral coil, while the anterior part forms a fin provided with a sucker. Radula with the central tooth tricuspid, sometimes only with a median tooth; inner lateral tooth large, bicuspidate, with an inner obtuse process; the other laterals are curved and aculeate.

Genus 1. Atlanta, Lesueur, 1817.

Shell discoidal, fragile, transparent, compressed, carinated throughout, and capable of containing the whole animal; protoconch dextral,

forming a small nucleus ; aperture oval, narrow, fissured ; peristome simple, sharp. Operculum subtrigonal, with a small apical nucleus, which is dextrally spiral.

About forty species are known from the warmer parts of the Atlantic, the Mediterranean, the Pacific, &c.

Fragments of *Atlanta* were obtained in 110 fathoms off Great Barrier Island, unfortunately too imperfect for specific determination. (Hedley, T.N.Z.I., xxxviii, 76.)

Fam. **CARINARIIDÆ**, Grasset.

Animal having the visceral sac conical and small in proportion to the rest of the body, which cannot be withdrawn into the shell ; foot elongated, fin-shaped, with a sucker, but without an operculum.

Shell small in proportion to the size of the body, symmetrical, cup-shaped, thin and transparent.

Genus 1. CARINARIA, Lamarck, 1801.

Carinaria, Lam., Syst. A.s.V., 1801, 98. Type : *C. vitrea*, Lam.

Animal elongated, fusiform ; body smooth or granulated, gelatinous, semipellucid ; head large, cylindrical, with 2 tentacles which are slender and elongated, eyes near their outer bases ; ventral fin rounded, with a marginal sucker ; posterior extremity of body laterally compressed and terminating with 2 unequal tegumentary prolongations, one above and one below, which functionally are fins. Visceral mass protected by the shell. The branchiæ are triangular, numerous, and extending beyond the margin of the shell. Anus and female genital orifice on the right side of the nucleus ; the male copulatory organ exserted on the right side of the body, immediately above the ventral fin.

Shell thin, hyaline, glassy, symmetrical, conical, compressed, with a recurved apex, a minute dextrally-spiral nucleus, and a fimbriated dorsal keel ; aperture large, ovate, entire.

Eight species are known from the Mediterranean, Atlantic, Indian Ocean, the seas of China, and Tasman Sea.

Fossil.—Two species from the Miocene of Piedmont.

The food of the genus most likely consists of small *Scyphomedusæ* and *Pteropods*.

1. Carinaria australis, Quoy and Gaimard, 1833. Plate 17, fig. 20.

Carinaria australis, Q. & G., Voy. Astrol., ii, 1833, 394, pl. 29, f. 9–15 ; Gray, in Dieff. N.Z., 244 ; Hutton, C.M.M., 6 ; M.N.Z.M., 118 ; Crit. List, 38 ; Verco, T.R.S. S.Aust., xxix, 171.

Shell thin, hyaline, with broad and rather deep concentric grooves ; apex obliquely inclined ; dorsal keel undulated by the grooves extending over it. *Aperture* oval, slightly angled anteriorly.

Diameter and height, 6¼ mm. ; length, 12½ mm. (type).

Animal figured by Quoy and Gaimard.

Type in the Mus. Hist. Nat., Paris.

Hab.—Tasman Sea, between Australia and New Zealand ; type (Q. & G.). Mr. Hedley fixes the locality at about 158° E. longitude and 40° S. latitude. This is nearly half-way between Bass and Cook Straits, but somewhat nearer the former.

Remark.—It is not impossible that this rare mollusc inhabits New Zealand waters, and may be obtained some day with the surface-net.

Fam. **PTEROTRACHEIDÆ**, Gray.

Animal having the visceral sac very much reduced, without shell and mantle ; anus on the posterior part of the body ; foot provided with a sucker in the male only.

Genus 1. Pterotrachea, Forskal, 1775.

Pterotrachea, Forskal, Descript. Anim., 1775, 117. Type : *P. coronata*, Forskal. *Firola*, Bruguière, 1791. *Hypterus*, Rafinesque.

Animal elongated, fusiform ; head proboscidiform, without tentacles ; foot contracted at its base ; body carinated posteriorly, with a filiform appendage, considered to have the function of a caudal fin. Nucleus not terminal, covered by tegument, leaving only the posterior part open. Branchiæ numerous, triangular, arranged around the nucleus. Female genital orifice on the right side of the nucleus, near the middle ; orifice of the male organ on the right side of the body, between nucleus and ventral fin.

Distribution.—Atlantic, Mediterranean, Pacific.

The embryos of *Pterotrachea* are protected by an operculate shell, spiral, but the second whorl disconnected, a character which approaches them to the fossil genus *Cyrtolithes*. (Fischer.)

These molluscs occur sometimes in great abundance, and Péron and Lesueur said that, of all the animals the Mediterranean was nourishing, there was perhaps no other genus more abundant than *Pterotrachea ;* it is by thousands that one sees them floating at the surface of the sea in calm weather, or thrown up on the beach after gales, and sometimes they are brought up in the same abundance in the nets of the fishermen.

1. Pterotrachea coronata, Forskal. 1775. Plate 17, fig. 21.

Pterotrachea coronata, Forskal, Descript. Anim., 1775, 117. E. A. Smith, Chall. Rep., xxiii, 12. *Firola coronata*, Forskal : Cuvier, Règne Anim., ed. 2, iii, 69 ; Vayssière, Moll. Hétérop. provenant des campagnes des yachts " Hirondelle " et " Princesse Alice," 1904, 33, pl. 3, f. 33–41 ; Benham, T.N.Z.I., xxxviii, 245, pl. 40, f. 1–3. *Biphore éléphantin*, Bory de St. Vincent. *Pterotrachea umbilicata*, Delle Chiaje. *Firola Edwardsiana*, Deshayes. *Hypterus erythrogaster*, Rafinesque.

Animal large, whitish, transparent; body smooth, except the medio-ventral and lateral parts, which possess small white opaque tubercles; there are 6 to 8 distinct frontal tubercles, arranged in two series; ventral fin very large, oval, rounded, inserted at a little behind the middle of the body. *Visceral sac* relatively large, with 16 gill-filaments of medium size; *posterior end* relatively short, tricarinate above, bicarinate below, with a bilobate caudal fin. Upper part of the *buccal orifice* with 2 rows of unequal hooks. *Radula* having the formula 2+1+1+1+2.

Length of New Zealand specimen, about 320 mm.

Anatomy.—Leydig, Zeitschr. f. wissenschaftl. Zoologie, iii, 328.

Hab.—Long Beach, north of Otago Harbour (W. Fels). Also Mediterranean.

Suborder 2. STENOGLOSSA.

Pectinibranchs in which the nervous system is much concentrated. The pericesophageal nerve-collar is always posterior to and is not traversed by the salivary glands. A well-developed proboscis, an unpaired œsophageal gland (the gland of Leiblein, or poison-gland), a pallial siphon, and a verge are always present. The radula is narrow, and in the majority of genera (*Rachiglossa*) has a single lateral on each side of the median tooth; in the remainder of the group (*Toxoglossa*) there is no median tooth, and the radular formula is therefore 1+0+1.

Tribe 1. RACHIGLOSSA.

These are *Stenoglossa* with a highly developed proboscis, a pallial siphon, and rudimentary jaws; the radular formula is 1+1+1.

Fam. **TURBINELLIDÆ**, Sowerby.

Animal with a small head, tentacles convergent at the base, with the eyes on the outer sides; proboscis long; foot broad. Radula triserial, the central tooth always tricuspidate, the lateral teeth mostly bicuspidate, the cusps of unequal length.

Shell solid, pyriform or fusiform, with a rather long canal; columella more or less thickened, with plaits or sometimes smooth. Operculum corneous, oval-unguiform, the nucleus apical.

Genus 1. Megalatractus, P. Fischer, 1884.

Megalatractus, P. Fischer, Man. de Conch., 1884, 623. Type: *Fusus proboscidiferus*, Lamarck = *aruanus*, Gmelin. *Syrinx*, Bolten, Mus. Bolten., 1798, 121; not of Bohadsch, 1761.

Shell large, fusiform, widened in the middle, prominently spirally lirate, narrowly umbilicated.

Anatomy.—Kesteven, Mem. A.M., iv, 1904.

Distribution.—Australia, Tasmania, and New Zealand.

The genus is found in depths ranging from 20 to 100 fathoms.

1. Megalatractus maximus, Tryon, 1881. Plate, 18, fig. 1.

Siphonalia maxima, Tryon, Man. Conch. (i), iii, 135, pl. 54, f. 355; Hedley, Mem. A.M., iv, 1903, 374, pl. 38. *Megalatractus maximus*, Tryon: Murdoch and Suter, T.N.Z.I., xxxviii, 291, pl. 24, f. 28 (protoconch); Suter, T.N.Z.I., xxxix, 254. *Syrinx maximus*, Tryon: Suter, Rec. Canterbury Mus., i, No. 2, 124.

Shell large, narrow fusiform, narrowly umbilicated, whorls angled in the middle, canal long and open. *Sculpture* consisting of flat-topped spiral riblets parted by wide and shallow furrows with 1 or 2 fine spirals; the whorls of the spire sharply angled below the middle, on the last whorl above the flattened periphery, the angle cut into 12 to 14 sharp projecting nodules; the first two whorls below the nearly smooth protoconch are distinctly axially costate. *Colour:* The New Zealand specimens I have seen are uniformly light brown, but Australian shells are ornamented with dark-brown spots and lines. *Spire* high, conic, gradate, a little higher than the aperture without canal. *Protoconch* pupoid, polygyrate, consisting of 4 convex whorls with fine spiral riblets, crossed by incremental lines, nucleus central, small, slightly raised. *Whorls* 10 to 12, decollated shells have usually from 6 to 8 whorls, first slowly then more rapidly increasing, broadly shouldered, the spire-whorls straight above and below the angle, the body-whorl flatly convex below; base excavated. *Suture* superficial. *Aperture* slightly oblique, ovate, porcellanous within, sharply angled above, produced below into a long, broad, open canal, which is nearly straight or flexed in an S curve slightly bent backward. *Outer lip* distinctly angled, straight above, convex below, denticulate at the edge by the spiral sculpture, lirate within. *Columella* excavated, broadly rounded, smooth. *Inner lip* spreading as a very thin glaze beyond the columella and over the parietal wall, sharply drawn out on reaching the inner margin of the canal, where there is a distinct narrow umbilical fissure. *Operculum* oval, pointed at the apex, with distinct growth-lines and a strong callus on the inner outer side.

Diameter, 68 mm.; height, 145 mm. (decollated specimen of 7 whorls). According to Hedley, Australian specimens have a much larger size, 100 mm. by 237 mm. being recorded.

Anatomy.—Kesteven, Mem. A.M., iv, 419–50.

Type in the Museum of the Academie of Science, Philadelphia.

Hab.—Near Channel Island, Hauraki Gulf, in 25 fathoms; off Great Barrier Island, in 110 fathoms, one protoconch; New Brighton Beach, one dead washed-up shell (H. S.); east of Jones's Head, in 20 fathoms; west of Cape Runaway, in 105 fathoms (E. R. Waite).

Remark.—Sometimes the whorls are rounded, and there remains only a trace of the keel.

Fossil in the Pliocene of Waikopiro.

Fam. **FASCIOLARIIDÆ**, Adams.

Animal having the foot rather broad and short, the head small and narrow, with short tentacles, the eyes at their outer bases. Central tooth of the radula narrow; lateral teeth large, multicuspidate.

Shell fusiform, elongated; spire short, conic; canal long; columella smooth or with plaits near the base; outer lip simple. Operculum corneous, oval, with the nucleus apical.

KEY TO GENERA.

A. Columella smooth	FUSINUS.
B. Columella with a few basal plaits	LATIRUS.

Genus 1. FUSINUS, Rafinesque, 1815.

Fusinus, Rafinesque, Anal. de la Nature, 1815, 145. Type: *Murex colus*, L. *Fusus*, Bruguière, 1789; Lamarck, 1799; not of Helbling, 1779. *Pseudofusus*, Monterosato, 1884. *Exilifusus*, Gabb, 1876; not of Conrad, 1866.

Foot short, quadrilateral, truncated, and with a transverse groove anteriorly. Tentacles short, conical, joined posteriorly. Male organ elongated, almost straight; siphon not extending beyond the canal of the shell. Radula triserial; central tooth small, narrow, multicuspidate; lateral teeth large, pectiniform, multicuspidate, the cusps long and narrow.

Shell imperforate, fusiform, elongated; spire long, acuminate, many-whorled; aperture oval, usually striate within; outer lip simple; columella smooth; canal long, straight, open. Operculum ovate, acute, nucleus apical.

Over sixty species are known, mostly from warm and temperate seas.

Fossil in the Secondary and Tertiary.

1. **Fusinus spiralis**, A. Adams, 1856. Plate 41, fig. 4.

Fusus spiralis, A. Ad., P.Z.S., 1855 (1856), 221; Hutton, M.N.Z.M., 50; T.N.Z.I., xvi, 227; Plioc. M., 40, pl. 6, f. 9; Tryon, Man. Conch. (1), iii, 68, 227, pl. 85, f. 593. *F. pensum*, Hutton, C.M.M., 1873, 8.

Shell fusiform, thin and fragile, whorls carinated and spinous. *Sculpture* consisting of 3 to 4 distant spiral threads upon the shoulder, one below the keel on the upper whorls, increasing to three on the lower whorls; base and canal distantly spirally lirate; growth-lines distinct, fine and dense, slightly flexuous; the sharp peripheral keel is produced into regular triangular spines on the spire-whorls, but they are absent on the body-whorl, small tubercles taking their place. *Colour* fulvous, with longitudinal flexuous bands of yellowish-white. *Spire* high, narrowly conic, more than twice the height of the aperture; outlines gradate. *Protoconch* of 2 whorls, which are usually somewhat tilted; the first whorl large, angled, flat above; the second whorl a little narrower; both smooth. *Whorls* about 10, sharply keeled at the periphery, shoulder flat or slightly convex, the last whorl more rounded, with the keel less prominent; base contracted. *Suture*

superficial, slightly uneven, margined above by a fine thread. *Aperture* broadly ovate, almost round, suddenly narrowed into the canal, which is much produced, narrow, quite straight, and of about the same length as the spire. *Outer lip* sharp, slightly denticulated by the spiral sculpture. *Columella* straight, smooth. *Inner lip* narrow, thin, extending over the parietal wall and down into the canal. *Operculum* unknown.

Diameter, 22 mm.; height, 73 mm. Angle of spire, 42°.

Animal unknown.

Type in the British Museum.

Hab.—Cook Strait, near Kapiti Island; off Great Barrier Island, in 110 fathoms.

Fossil in the Pliocene and Miocene.

Genus 2. Latirus, Montfort, 1810.

Latirus, Mtft., Conch. Syst., ii, 1810, 531. Type: *Murex gibbulus*, Gmel. *Polygona*, Schumacher, 1817. *Plicatella*, Swainson, 1840. *Eolatirus*, Bell, 1883. *Plesiolatirus*, Bell, 1883. *Taron*, Hutton, 1883.

Animal having conical tentacles, the eyes at their outer bases; foot oval; siphon short. Radula with the central tooth tricuspidate, laterals with about 10 denticles, broader at the base, not so long as in *Fasciolaria*.

Shell turreted, fusiform, sometimes umbilicated; spire produced; whorls nodulous; aperture oval-oblong; outer lip thin, crenulated; columella straight, with 2 or 3 small oblique plaits in front. Operculum oval, elongated, unguiculate, concave at the columellar border; nucleus apical.

The genus is represented in the Indian Ocean, the Philippines, Australasia, Pacific Islands; also in the West Indies.

Fossil.—It appears first in the Cretaceous, and is not uncommon in the Tertiary.

Hutton's genus *Taron* was founded on a supposed peculiarity of the operculum of his *Trophon dubius*—namely, that of being subconcentric. This, however, is not correct, as the nucleus is distinctly apical; but the muscular scar is subcentral, near the columellar border. The dentition of *T. dubius* is decidedly that of *Latirus*. (See also Melvill, Mem. & Proc. Manchester Lit. & Philos. Soc. (4), iv, 12.)

1. Latirus Huttoni, Suter, 1908. Plate 18, fig 2.

Trophon dubius, Hutt., J. de Conch., xxvi, 1878, 13; T.N.Z.I., x, 293; M.N.Z.M., 49. *Urosalpinx dubia*, Hutt.: Tryon, Man. Conch. (1), ii, 156. *Taron dubius*, Hutt., T.N.Z.I., xvi, 227; Plioc. M., 40, pl. 6, f. 10. *Latirus Huttoni*, Suter, T.N.Z.I., xl, 1907 (1908), 369, pl. 30, f. 3.

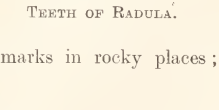
Shell small, ovate-fusiform, solid, imperforate or with a light umbilical chink. *Sculpture* consisting of prominent narrow and rounded spiral ribs, narrower than the interstices, 3 to 4 on the penultimate, about 12 on the body-whorl, crossed by about 12 distinct broadly

rounded axial costæ, usually marked by nodules only on the last half of the body-whorl; growth-lines straight, fine and distinct, slightly lamellar. *Colour* dark reddish-brown, flesh-colour around the canal; aperture dark purple inside; columella white. *Epidermis* persistent, greenish-brown. *Spire* sharply conical, a little higher than the aperture; outlines straight. *Protoconch* small, globular, axially costate. *Whorls* 6, first slowly then rather rapidly increasing, distinctly narrowly shouldered, convex below; base contracted. *Suture* lightly impressed. *Aperture* vertical, oval, narrowly canaliculate above, produced below into a short slightly oblique open canal, rounded below. *Outer lip* convex, sharp, slightly thickened and denticulate inside, but sometimes smooth. *Columella* vertical, almost straight, either smooth or with a distinct tubercle below and one or two much smaller ones above it. *Inner lip* narrow and thin, spread over the parietal wall, which bears a distinct plait close to the outer lip, and descending, narrowed to a long point, to the base of the canal, sometimes leaving there a slight umbilical chink. *Operculum* corneous, with apical nucleus.

Diameter, 10·5 mm.; height, 18 mm. (type).

Animal of a bright salmon-red colour.

Dentition.—Hutton, T.N.Z.I., xv, 119, pl. 13, f. E.



Teeth of Radula.

Type in the Otago Museum, Dunedin.

Hab.—Auckland Harbour, between tide-marks in rocky places; East Cape; Bay of Islands.

Fossil in the Pliocene.

Fam. **MITRIDÆ**, Adams.

Animal having a small narrow head; tentacles close together at the base, elongated, bearing the eyes at their sides; proboscis very long, cylindrical, flexible; siphon moderately long, simple at the base; foot small, triangular, usually truncate in front. Purple gland well developed; verge narrow. The dentition presents several distinct types.

Shell fusiform and solid, the spire pointed, the aperture elongated, and the columella folded; mostly destitute of epidermis, which is very thin, smooth, and translucent when present. Operculum absent or rudimentary.

The *Mitridæ* are abundant in the coral seas, and usually in a moderate depth; small species are subtropical, and some are found in colder latitudes.

Key to Genera.

A. Shell fusiform, thick; aperture without a canal, notched at the base; columella with 4 or 5 plaits; outer lip smooth inside . . . Mitra.

B. Shell elongated, turreted, axially plicately ribbed; aperture with a more or less recurved canal; columella with 3 or 4 plaits; outer lip internally striate . . . . . Vexillum.

Genus 1. Mitra, Martyn, 1784.

Mitra, Martyn, Un. Conch., i, f. 19. First species: *M. tessellata*, Martyn. *Thiarella*, Swainson, 1840. *Mitraria*, Ratinesque, 1815. *Mitrolithes*, Krüg, 1823 (*fide* Tryon).

Radula triserial; the central tooth narrow, multicuspidate; the laterals very broad, multicuspidate; the cusps sharp and subequal.

Shell fusiform or oval, solid; spire elevated, pointed; aperture narrow, notched at the base; outer lip not reflected, thickened and smooth within; columella transversely, somewhat obliquely plicate. No operculum.

Over two hundred species, mostly from tropical and temperate seas, have been described. The Philippine Islands are particularly rich in these elegant and beautiful shells.

Fossil in the Tertiary.

Key to Species.

A. Shell fusiform, uniformly dark brown, without axial sculpture, spire higher than the aperture .. .. *carbonaria.*
B. Shell shortly fusiform, fulvous with large white spots, upper whorls axially costate, spire lower than the aperture .. *albopicta.*
C. Shell very small, shortly fusiform, greyish-white, spirally grooved and axially plicate, spire half the height of the aperture .. *Hedleyi.*

1. Mitra albopicta, E. A. Smith, 1898. Plate 46, fig. 9.

Mitra albopicta, E. A. Smith, P. Mal. S., iii, 1898, 21, f. 5 in text.

Shell shortly fusiform, solid, shining, fulvous with irregular white spots, upper whorls distinctly axially costate. *Sculpture* consisting of a few fine spiral grooves below the suture, and narrow oblique spiral riblets on the base; the three whorls below the protoconch with slightly oblique, close, broadly rounded axial costæ; the intestices much narrower; on the succeeding whorls the riblets are irregular, and disappear more or less. *Colour* fulvous, with short irregular zigzagging white spots below the suture and upon the base, a revolving series of small elongate white spots on the lower third of the body-whorl, aperture light purple inside, inner lip white. *Spire* acutely conic, a little lower than the height of the aperture; outlines lightly convex. *Protoconch* very small, the minute nucleus papillate, excentric. *Whorls* 7, slightly convex, first slowly increasing, the last a little more than two-thirds of the whole height; base somewhat contracted on the side of the pillar. *Suture* moderately deep, impressed. *Aperture* oblique, high and narrow, angular above, a little narrowed below, truncated, and slightly notched. *Outer lip* subvertical, almost parallel with the columella, with a rather blunt edge, lightly thickened inside above, smooth. *Columella* slightly oblique, with 4 equidistant elevated plaits, the uppermost almost horizontal, the others oblique; the first is slightly smaller than the two in the middle, the lowest considerably less conspicuous. *Inner lip* very thin, narrow, sharply

defined on the outside, forming a very thin glaze upon the faintly excavated parietal wall.

Diameter, 9·5 mm. ; height, 21·5 mm.

Animal unknown.

Type in my collection.

Hab.—Mokohinau Islands (type) ; Bay of Islands (J. C. Anderson).

Remark.—In form and general proportions resembling *M. pica*. Reeve, from Australia, but larger and differently coloured.

2. Mitra carbonaria, Swainson, 1822. Plate 46, fig. 10.

Mitra carbonaria, Swainson, Bligh Cat. Append., 1822, 10 ; "Exotic Conchology," 1841, 37 ; Hedley, P.L.S. N.S.W., xxxiii, 1908, 461. *M. melaniana*, Lamarck : Küster, Conch. Cab., 1841, 44, pl. 8, f. 7, 8 ; Man. Conch. (1), iv, 127, pl. 37, f. 118 ; Index, 73, not of Lamarck. *M. nigra*, Chemnitz : Reeve, Conch. Icon., ii, 1844, pl. 5, f. 33 ; Sowerby, Thes. Conch., iv, 1874, 6, pl. 352, f. 4 ; Angas, P.Z.S., 1867, 193 ; not of Chemnitz. *Volutomitra digna*, A. Adams, P.Z.S., 1854 (1855), 135 ; Thes. Conch., iv, Mitra, 6, pl. 361, f. 115.

Shell moderately large, fusiform, solid, dark brown, polished. *Sculpture* consisting of unequal flat cinguli with linear interstices, reticulated by straight growth-lines ; the cinguli at the base are narrow, rounded, and distant. *Colour* dark olive-brown or dark chestnut. *Spire* elevated, narrowly conic, a little higher than the aperture ; outlines straight or lightly convex. *Protoconch* broadly convex, smooth. *Whorls* about 6, regularly increasing, flattish, the last two-thirds of the whole height ; base slightly contracted. *Suture* superficial, uneven. *Aperture* high and narrow, angular above, truncated and moderately notched at the base. *Outer lip* vertical, almost straight, edge blunt, smooth and slightly thickened within. *Columella* subvertical, with 5 equidistant oblique plaits, decreasing in size from above. *Inner lip* narrow, well limited, spreading over the slightly excavated parietal wall.

Diameter, 15 mm. ; height, 48 mm. (specimen, Bay of Islands).

Animal unknown.

Type in the Manchester Museum.

Hab.—Bay of Islands ; East Cape ; Tauranga. Only worn and empty shells have hitherto been found. The type is from Port Jackson, New South Wales.

3. Mitra Hedleyi, Murdoch, 1905. Plate 18, fig. 3.

Vulpecula (*Pusia*) *Hedleyi*, Murd., T.N.Z.I., xxxvii, 1904 (1905), 228, pl. 8, f. 21.

Shell very small, shortly fusiform, rather thin, lightly polished, with minute ornamentation. *Sculpture* consisting of fine narrow and somewhat unequal spiral liræ, the interspaces linear, more prominent on the base ; crossed by numerous dense unequal and straight axial plications, regularly spaced on the third whorl only, and more distinct at the suture. *Colour* greyish-white or light brown, occasion-

ally very faintly mottled with white; aperture light brown inside. *Spire* short, conical; apex blunt, height about half that of the aperture; outlines lightly convex. *Protoconch* small, papillate, of 2 smooth whorls. *Whorls* 4½ to 5, the last very high, faintly convex; base very little contracted. *Suture* lightly impressed. *Aperture* oblique, narrow, angled above, not contracted below, slightly notched. *Outer lip* uniformly moderately curved, sharp, slightly thickened inside. *Columella* subvertical, with 4 oblique plaits, equally spaced, slightly decreasing in size towards the base. *Inner lip* narrow, sharply bounded on the outside, forming a thin glaze on the slightly arcuate parietal wall.

Diameter, 2·6 mm.; height, 5·4 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Whangarei Heads, dredged in shallow water, type (C. Cooper); near Little Barrier Island, in 20 fathoms (R. H. Shakespear).

Remark.—The absence of regular axial costæ on the body-whorl and a canal, induce me to class this species under *Mitra*.

Genus 2. Vexillum, Bolten, 1798.

Vexillum, Bolten, Mus. Bolten. (2), 1798, 138. First species: *Mitra plicaria*, Lam. *Turris*, Montfort, 1810; not of Bolten, 1798. *Vulpecula*, Blainville, 1824. *Tiara*, Swainson, 1840. *Turricula* (Klein). Fischer, 1884; not *Vexilla*, Swainson, 1840.

Animal similar to that of *Mitra*. Radula triserial; the central tooth transverse, the upper margin slightly concave, with numero sharp denticles on the lower margin; lateral teeth simple, with one cutting-point, elongate and curved.

Shell elongate, turreted, axially plicately ribbed; spire acuminated; aperture narrow, with a more or less recurved canal at the base; outer lip usually internally striated; columella with 4 but slightly oblique plaits. The protoconch is papillate, paucispiral.

This genus is exclusively tropical and subtropical in distribution, and it is abundantly represented in central Polynesia.

Fossil in the Tertiary.

Key to Species.

A. Columella with 3 plaits .. .. *Waitei.*
B. Columella with 4 plaits.
  a. Height of spire less than that of aperture; spiral liræ distinct only below the suture and on the base.. *obscurum.*
  aa. Height of spire about equal that of aperture.
    b. Suture margined.
      c. Outer lip much contracted at the base; whorls with about 14 large nodules on the angle of the shoulder .. .. *marginatum.*
      cc. Outer lip but little contracted at the base; axial riblets 14–15, prominent; interstices spirally lirate .. .. *pseudomarginatum.*

bb. Suture not margined.
c. With distinct spiral liræ; dimensions 4 mm. by 8 mm. .. .. *rubiginosum.*
cc. With obsolete spiral liræ; dimensions 6 mm. by 14 mm. .. .. *planatum.*

1. Vexillum marginatum, Hutton, 1885. Plate 18, fig. 4.

Turricula marginata. Hutton, T.N.Z.I., xvii, 1884 (1885), 315, pl. 18, f. 4; Plioc. M., 47. *Vulpecula* (*Pusia*) *biconica,* M. & S., T.N.Z.I., xxxviii, 1905 (1906), 289, pl. 23, f. 22.

Shell very small, biconical, imperforate, a row of nodules on the lower whorls, suture margined, aperture narrow, with 4 columellar plaits. *Sculpture:* On the third to fifth whorls there are oblique axial costæ, produced into nodules on the angle of the whorls, below the suture a broad rim, under the nodules of the last whorl 2 fine spiral threads and several more towards the base. *Colour* white, with fulvous on the nodules of the first half of the last whorl, continued in broad zigzag lines down to the base on the second half. *Spire* conoidal, of nearly the same height as the aperture; outlines straight. *Protoconch* of $1\frac{1}{2}$ whorls, papillate, smooth, glossy; nucleus slightly excentric, broadly convex. *Whorls* 5, rather rapidly increasing, shouldered with about 14 short nodulous ribs, disappearing shortly before reaching the outer lip; base distinctly contracted. *Suture* distinct, slightly impressed, broadly margined below. *Aperture* somewhat oblique, narrow, with subparallel sides, slightly channelled above, produced at the base into a distinct short open and recurved canal, not notched at the base. *Outer lip* thin and sharp, subangled above, contracted below. *Columella* subvertical, with 4 plaits, the first and second nearly horizontal, the others oblique, the basal plait very small. *Inner lip* narrow, forming a white-enamel layer on the concave parietal wall.

Diameter, 2·8 mm.; height, 5 mm.

Animal unknown.

Type, from the Pliocene, in the Canterbury Museum, Christchurch.

Hab.—Off Great Barrier Island, in 110 fathoms; off Cuvier Island, in 37 fathoms (Captain Bollons); $21\frac{1}{2}$ miles north-east of Wreck Reef, Stewart Island, in 50–54 fathoms (E. R. Waite); Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons); Snares, in 50 fathoms (Captain Bollons).

Remarks.—This species is exceedingly variable in the development of the sculpture; it is often very prominent and bold, but may become rather inconspicuous. The nodulous sculpture and the zigzag colour-markings are characteristic. The outer lip is sometimes very much contracted at the base; the canal, therefore, very well marked.

Fossil in the Pliocene of Wanganui.

2. Vexillum pseudomarginatum, n. sp. Plate 18, fig. 5.

Vulpecula marginata, Suter, T.N.Z.I., xl, 1907 (1908), 349, pl. 27, f. 8; not of Hutton.

Shell small, fusiform, rather thin, axially costate and spirally lirate. *Sculpture* consisting of fine spiral liræ, usually 2 below the suture broader and much more prominent, about 7 on the penultimate whorl; they are again more conspicuous on the base; straight, angularly rounded axial riblets extend over all the whorls, the protoconch excepted, 14 to 15 on a whorl, and they vanish only on approaching the base, the interstices of about the same width as the riblets; only the two stronger spirals below the suture pass over the axials. *Colour* white. *Spire* elevated conic, about the same height as the aperture; outlines slightly convex. *Protoconch* small, papillate, of $1\frac{1}{2}$ smooth and convex whorls, the nucleus excentric. Whorls 5 to 6, the last high, moderately convex, the base distinctly contracted. *Suture* impressed, margined below. *Aperture* narrow, rather broadly angled above, with a short widely open and slightly recurved canal below, its base slightly notched. *Outer lip* thin and sharp, lightly convex, contracted below. *Columella* subvertical, with 4 equally spaced and slightly oblique plaits, which decrease in size towards the base; the uppermost plait continued as a strong riblet over the neck. *Inner lip* thin and narrow, spreading over the concave parietal wall.

Diameter, 2·5 mm.; height, 6·2 mm. (shell of 5 whorls).

Animal unknown.

Type in my collection.

Hab.—Five miles south of Cuvier Island, in 38 fathoms (Captain Bollons).

Fossil in the Pliocene of Wanganui.

Subsp. angulatum, Suter, 1908.

Vulpecula marginata angulata, Suter, T.N.Z.I., xl, 1907 (1908), 350.

Distinguished from the species by the following characters: the shell is slightly more ventricose, all the whorls below the protoconch distinctly shouldered; the axial costæ somewhat nodulous upon the carina; the spiral liræ are much more numerous, and consequently finer; the suture is undulating, more or less distinctly margined below, but the 2 more prominent cinguli are wanting; the outer lip is angled above.

Diameter, 2·5 mm.; height, 5·5 mm. (specimen of 5 whorls).

Animal unknown.

Type in my collection.

Hab.—Five miles south of Cuvier Island, in 38 fathoms, type (Captain Bollons). Apparently rarer than the species.

3. Vexillum obscurum, Hutton, 1873. Plate 46, fig. 11.

Mitra obscura, Hutt., C.M.M., 19; J. de Conch., 1878, 21; M.N.Z.M., 60; Index, 73; Suter, P. Mal. S., ii, 201, fig. in text.

Shell small, ovate-conical, slightly turreted, axially costate, dark brown, banded or spotted with white. *Sculpture* consisting of more or less distinct spiral liræ with linear interspaces; all the whorls below the protoconch have straight, elevated, and rounded axial ribs, about 20 on the penultimate whorl, extending on the body-whorl to the base, which is distinctly spirally striated. *Colour* blackish-brown, with white spots or a white band below the suture; a light band on the middle of the last whorl is sometimes present; the whole of the body-whorl has the brown zone minutely dotted with white; base fuscous or light orange; aperture purplish within. *Spire* low, flatly shouldered, conical, height a little more than half that of the aperture; outlines faintly convex. *Protoconch* small, smooth, of 2 whorls, papillate. *Whorls* 7, somewhat flattened below the suture, convex; base slightly contracted. *Suture* superficial, undulating. *Aperture* narrow, the margins parallel, roundly angled above, produced below into a short, open, and lightly recurved canal. *Outer lip* angled and thickened inside above, edge blunt, smooth inside. *Columella* subvertical, with 4 but little oblique plaits, the uppermost transverse, the lowest minute. *Inner lip* inconspicuous.

Diameter, 3·5 mm.; height, 9 mm. Angle of spire, 60°.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Bay of Islands (type); Mokohinau Islands.

Remark.—The somewhat turreted spire, prominent axial ribs extending over the body-whorl, and the presence of a recurved canal clearly indicate the species to belong to the genus *Vexillum*.

4. Vexillum planatum, Hutton, 1885. Plate 18, fig. 6.

Turricula planata, Hutt., T.N.Z.I., xvii, 1884 (1885), 315, pl. 18, f. 3; Plioc. M., 47. *Vulpecula planata*, Hutt., Index, 74.

Shell small, ovato-fusiform, solid, axially costate, black. *Sculpture* consisting of distant not very distinct spiral striæ, the base with a few oblique rounded riblets; all the whorls below the protoconch are prominently axially costate, the ribs beginning a short distance below the suture above, but extending to the suture below and nearly to the base on the body-whorl; they number about 14 on a whorl, are angularly rounded, the interstices of the same width, and becoming obsolete on the last half-turn of the body-whorl. *Colour* black, shining; protoconch light purple; base red. *Spire* elevated conic, acute, of the same height as the aperture; outlines nearly straight. *Protoconch* of 1½ smooth whorls, minute, papillate. *Whorls* 7, first slowly increasing, the last high, flatly convex, sometimes lightly shouldered;

base somewhat contracted. *Suture* impressed, undulating. *Aperture* narrow and high, angled above, with a short, open, and slightly recurved canal below, which is distinctly notched at the base. *Outer lip* moderately arched, sharp, somewhat thickened and smooth inside. *Columella* subvertical, with 4 slightly oblique plaits, decreasing in size towards the base, the uppermost continued as an oblique riblet over the neck.

Diameter, 6 mm. ; height, 14 mm. (type, from the Pliocene). Diameter, 4 mm. ; height, 11 mm. (Auckland ; Recent specimen).

Animal unknown.

Type, from the Pliocene of Wanganui, in the Canterbury Museum, Christchurch.

Hab.—Hauraki Gulf.

Remark.—The type is a rather large form. Most of the fossil specimens I have seen are smaller.

Fossil in the Pliocene.

5. Vexillum rubiginosum, Hutton, 1873. Plate 18, fig. 7.

Columbella (*Atilia*) *rubiginosa*, Hutt., C.M.M., 20. *Mitra rubiginosa*, Hutt., J. de Conch., 1878, 22 ; M.N.Z.M., 60. *Turricula* (*Pusia*) *rubiginosa*, Hutt., T.N.Z.I., xvi, 226 ; Plioc. M., 46, pl. 6, f. 19. *Columbella rubiginosa*, Hutt. : Pace, P. Mal. S., v, 130. *Vulpecula rubiginosa*, Hutt., Index, 74.

Shell small, fusiform, slightly turreted, axially costate, brown or purple. *Sculpture* consisting of distant spiral grooves on the spire-whorls, usually 1 below the edge of the shoulder, sometimes cutting up the top of the axial ribs into nodules, and 2 above the suture ; the lower half of the body-whorl and the base are distinctly spirally lirate ; axial riblets begin to appear on the second whorl below the protoconch ; they begin at the edge of the shoulder, and continue to the suture below ; they are straight, equidistant, rounded, with interspaces of the same width, incised by the spiral grooves ; on approaching the outer lip they are getting obsolete, and they also vanish on the base. *Colour* blackish-purple or reddish-brown, with a white spiral band on the periphery of the last whorl ; base usually orange. *Spire* conic, turreted, of the same height as the aperture ; outlines almost straight. *Protoconch* small, smooth, papillate, of 1½ whorls, which are of a pinkish colour. *Whorls* about 7, the last high, with a flat and narrow shoulder, flatly convex below. *Suture* superficial. *Aperture* long and narrow, angled above, with a widely open and somewhat recurved canal, which is notched at its base. *Outer lip* subangled above, lightly curved, edge rather blunt, smooth within. *Columella* slightly oblique, with 4 moderately oblique plaits, decreasing in size towards the base, the lowest minute ; they are usually continued as spirals on the neck. *Inner lip* thin, narrow, distinctly limited, extending over the concave parietal wall, which has a low tubercle below the suture.

Diameter, 3·8 mm. ; height, 7·5 mm. (type).

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—North and South Islands; Stewart Island; Chatham Islands (type). From low-water mark to 25 fathoms.

Fossil in the Pliocene.

6. **Vexillum Waitei**, Suter, 1909. Plate 18, fig. 8.

Vexillum Waitei, Suter, Rec. Canterbury Museum, i, No. 2, 1909, 124, pl. 12, f. 3.

Shell small, fusiform, turreted, with strong axial ribs, rendered slightly nodulous by spiral liræ, with only 3 columellar folds. *Sculpture* consisting of strong and sharp spiral threads, 4 on the penultimate whorl, the interstices somewhat broader than the threads, a small and flat thread below the suture; they are crossed by distant broadly rounded axial ribs, 10 to 11 on a whorl, and they are cut up into broad nodules by the spirals; they vanish on approaching the base; growth-lines very fine and crowded. *Colour* white. *Spire* elevated conic, turreted, about the same height as the aperture; outlines slightly convex. *Protoconch* small, of 1½ smooth whorls. *Whorls* 4 to 5, distinctly shouldered, lightly rounded below the keel; base somewhat contracted. *Suture* not much impressed, margined. *Aperture* high and narrow, angled above, with an open, short, and slightly recurved canal below, its base not notched. *Outer lip* convex, indistinctly angled above, and somewhat contracted below. *Columella* slightly oblique, with 3 plaits, the lowest a little smaller. *Inner lip* thin and narrow, forming a very thin layer on the concave parietal wall, drawn out to a long and fine point along the inner edge of the canal.

Diameter, 2·7 mm.; height, 6·5 mm.

Animal unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—21½ miles north-east of Wreck Reef, Stewart Island, in 50 to 54 fathoms, type (E. R. Waite); Snares, in 50 fathoms (Captain Bollons).

Fam. CHRYSODOMIDÆ, Cossmann.

Animal with a rather large foot, truncated in front; tentacles with the eyes at their outer sides. Radula triserial, lateral teeth with 2 to 4 cusps.

Shell solid, rather thick, usually with an epidermis; fusoid, oval, elongated; protoconch smooth, well developed, with a papillate nucleus, which is always tilted; whorls convex, ornamented by spiral ribs, and sometimes axial costæ, which become nodulous in certain genera; body-whorl ventricose, base excavated; aperture oval, with or without a posterior channel, produced into a moderately long canal anteriorly, which is always inflected to the right or backwards, ex-

tremity not sinuated ; outer lip simple or thickened and lirate within. slightly convex ; columella smooth, excavated above, twisted with the canal below. Operculum unguiform, with apical nucleus.

KEY TO GENERA.

A. Canal recurved ; spire nodose or carinated ; outer lip thin or but slightly thickened ; columella smooth	SIPHONALIA.
B. Canal distinctly obliquely recurved ; spire smooth or axially costate ; outer lip sinuated above, thickened, striate within ; columella slightly ridged	EUTHRIA.

Genus 1. SIPHONALIA, A. Adams, 1863.

Siphonalia, A. Ad., A.M.N.H. (3), xi, 1863, 202. Neotype : *Buccinum cassidariæforme*, Reeve.

Shell ovately fusiform, rather thin, with a very thin epidermis ; spire shorter than the aperture ; last whorl ventricose, shouldered. usually nodosely plicate and spirally ribbed ; aperture large, oval ; outer lip thin ; columella smooth ; canal rather short and twisted. Operculum ovate, nucleus apical.

This genus is principally of tropical and subtropical distribution ; its metropolis is Japan, a few forms being found, however, on the opposite shores of the west coast of North America ; some species also occur in Australasian waters.

The genus *Siphonalia* is well represented in the Eocene of Patagonia, Chile, and Australia, but it occurs neither Recent nor fossil in North America. It therefore must be considered as a tropical genus of the Indo-European Eocene sea which has not extended its migrations to Central or North America. (Von Ihering.)

Vernacular Name.—Spindle-shell.

KEY TO SUBGENERA.

A. Canal short, last whorl carinated	SIPHONALIA.
B. Canal long, last whorl carinated	PENION.
C. Canal moderately long, last whorl rounded	AUSTROFUSUS.

Subgen. 1. SIPHONALIA, s. str.

1. **Siphonalia nodosa**, Martyn, 1784. Plate 44, fig. 17.

Buccinum nodosum, Mart., Un. Conch., i, 1784, f. 5. *Siphonalia nodosa*, Mart., Man. Conch. (1), iii, 136, pl. 56, f. 376, 377 ; Hutton, T.N.Z.I., xvi, 229 ; Murdoch and Suter, T.N.Z.I., xxxviii, 292. *Buccinum raphanus*, Lam., Voy. Astrol., ii, 428, pl. 31, f. 5, 6. *B. triton*, Lesson, Rev. Zool., 1841, 37 ; 1842, 237 : Hutton, C.M.M., 11. *Fusus nodosus*, Mart., Conch. Icon., iv, 1847, f. 41 ; Hutton, C.M.M., 11. *Neptunea nodosa*, Mart. : Hutton, M.N.Z.M., 50. *Fusus* (*Neptunea*) *nodosus*, Mart., Chall. Rep., xv, 200.

Shell not large, fusiform, ventricose, shouldered, rather thin, with a short and widely open canal. *Sculpture* consisting of equidistant unequal spiral liræ, usually with a fine thread in the interspace : on

the base about 6 to 8 liræ are much more prominent than the others; the spire-whorls are carinated at the middle, the body-whorl is bicarinate, the lower carina, beginning at the suture, less pronounced; the axial sculpture consists of slightly oblique low ribs, to which correspond sharply elevated nodules on the keels, but the ribs are not continued over the base; the growth-lines are well marked, and in some places reticulate the spiral sculpture. The *colour* varies from yellowish-white longitudinally streaked with brown to brownish-purple. *Epidermis* thin, persistent, olivaceous. *Spire* conic, less than the height of the aperture with canal; outlines straight. *Protoconch* conic, the apex but slightly deviated from the axis, of $3\frac{1}{2}$ convex whorls, which are smooth, except the last half-turn, which is axially costate. *Whorls* about 10, first very slowly then more rapidly increasing; the spire-whorls are flat or slightly concave above and below the carina; the body-whorl straight between the two keels, base somewhat contracted. *Suture* superficial, undulating. *Aperture* oblique, angled above and on the outer lip, produced below into a short widely open canal, which is oblique and slightly turned backward: its base sinuated, with a distinct fasciole on the outside below the pillar. *Outer lip* sharply angled, thin and sharp, distantly finely lirate within. *Columella* vertical, almost straight, arcuate, on the junction with the parietal wall. *Inner lip* rather thickly callous, spreading somewhat beyond the columella, forming a thick white callosity on the parietal wall, narrowed below and forming the inner rounded margin of the canal. *Operculum* oval, sharply pointed, the nucleus apical; growth-lines very distinct.

Diameter, 21 mm.; height, 40 mm.: angle of spire, 55°. Diameter, 35 mm.; height, 63 mm. (large specimen).

Dentition.—Hutton, T.N.Z.I., xv, 119, pl. 13, f. G.

Type lost.

Hab.—North and South Islands, but not south of Banks Peninsula, below tide-marks; Auckland Harbour, occasionally washed up; near Channel Island, Hauraki Gulf, in 25 fathoms; a few miles west of Cuvier Island, in 44 fathoms (Captain Bollons); off Great Barrier Island, in 110 fathoms; Manawatu coast; Cook Strait; Queen Charlotte Sound, in 16 fathoms (Captain Bollons), in 10 fathoms ("Challenger" Exp.); off New Brighton, in 12 fathoms (H. S.); Akaroa Harbour, in 2 to 8 fathoms (H. S.). Brought to England by Captain Cook.

Fossil in the Miocene and Pliocene.

Subgen. 2. Penion, P. Fischer, 1884.

Penion, P. Fischer, Man. de Conch., 625. Type: *Siphonalia dilatata*, Q. & G.

Shell usually large, fusiform, the protoconch smooth, paucispiral, slightly bulbous, nucleus deviated; whorls angled, ornamented with

spiral liræ and axial ribs, the last more or less dilated, rapidly excavated at the base; aperture pyriform, with a long, narrow, and curved canal.

2. Siphonalia dilatata, Quoy and Gaimard. 1833. Plate 43, fig. 6.

Fusus dilatatus, Q. & G., Voy. Astrol., ii, 1833, 498, pl. 34, f. 15, 16; Hutton, C.M.M., 8; Conch. Icon., iv, pl. 13, f. 49. *Neptunæa dilatata*, Quoy: Hutton, M.N.Z.M., 50. *Siphonalia dilatata*, Q. & G.: Hutton, T.N.Z.I., xvi, 228; Tryon, Man. Conch. (1), iii, 135, pl. 54, f. 356–59. *Fusus adustus*, Philippi, Abbildungen, ii, 1845–47, Fusus, pl. 2, f. 7. *F. pastinacea*, Reeve, Conch. Icon., iv, 1847, f. 50. *Siphonalia oligostira*, Tate, T.R.S. S.Aust., xiv, 1891, 258, pl. 11, f. 6.

Shell large, ovato-fusiform, solid, spirally lirate, and with a prominent nodulous keel on the lower whorls. *Sculpture* consisting of unequal spiral cords, strong ones alternating with much narrower and lower liræ, the sculpture extending over the base to the canal; the axial sculpture is formed by vertical, broad, and rounded ribs, almost obsolete on the last two whorls, but produced into strong triangular nodules, absent on the base; the growth-lines are oblique and flexuous, strong, and close together. *Colour* yellowish, the spiral cords reddish-brown, aperture white. *Spire* conical, lower than the aperture with canal; outlines straight. *Protoconch* consisting of 3 smooth convex whorls, globose, the small nucleus slightly tilted. *Whorls* about 10, the apex almost always broken off or much corroded; first very slowly but then rapidly increasing; the upper whorls lightly the lower ones strongly shouldered and carinated, shoulder straight, the last whorl slightly convex below the carina, very rapidly contracted at the base. *Suture* impressed, not deep, undulating. *Aperture* slightly oblique, large, angularly pyriform, acutely angled above and on the outer lip, produced below into a rather long, open, oblique, and slightly curved canal, lightly sinuate at its base. *Outer lip* slightly concave above the angle of the carina, sinuate below, the edge distinctly crenulated by spiral sculpture down to the end of the canal. *Columella* somewhat oblique and arcuate, smooth. *Inner lip* rather thick, extending beyond the pillar and over the parietal wall, narrowed below on approaching the canal, and forming the inner slightly raised and sharp margin of it, usually leaving a deep groove on the outside. *Operculum* small, oval, pointed, and unguiculate.

Diameter, 42 mm.; height, 75 mm. (type): angle of spire, 50°. Diameter, 68 mm.; height, 115 mm. (large Auckland specimen).

Animal having a rather large foot, pointed posteriorly; the tentacles thick and short, with the eyes on the outer sides near the middle; sides of the foot marbled with yellow and reddish-brown; sole yellowish.

Dentition.—Troschel, Das Gebiss d. Schnecken, ii, 74, pl. 6, f. 17: Hutton, T.N.Z.I., xv, 119, pl. 13, f. F; Verco, T.R.S. S.Aust., 1895, pl. 3, f. 9; Atlas, pl. 1, f. 5.

Type in the Mus. Hist. Nat., Paris.

Hab.—North Island, not uncommon on rocky ground. Also Tasmania and southern coasts of Australia. The type is from the Bay of Islands.

Fossil in the Miocene and Pliocene.

Subgen. 3. Austrofusus, Kobelt, 1879.

Austrofusus, Kobelt: Küster, Conch. Cab., Fusus, 127. Type: *Fusus alternatus*, Philippi.

Shell ovate, fusiform, the last whorl rounded, not angulated at the upper part; canal moderately long, but little curved.

Key to Species.

A. Height of shell with 8 to 9 whorls about 35 mm. or less .. *caudata.*
B. Height of shell with 8 to 9 whorls more than 35 mm.
a. Spiral grooves without additional spiral threads; height about 50 mm. .. .. *valedicta.*
aa. Spiral grooves with 1 or more spiral threads; height more than 50 mm. .. .. *mandarina.*

3. Siphonalia caudata, Quoy and Gaimard, 1833. Plate 44, fig. 18.

Fusus caudatus, Q. & G., Voy. Astrol., ii, 1833, 503, pl. 34, f. 20, 21. *Neptuæa caudata*, Q. & G.: Hutton, M.N.Z.M., 50. *Fusus australis*, Q. & G.: Tryon, Man. Conch. (1), iii, 55, pl. 34, f. 119; not of Quoy and Gaimard. *F. caudatus*, Q. & G.: Hutton, T.N.Z.I., xvi, 227. *Siphonalia mandarina*, var. *caudata*, Q. & G., Index, 72.

Shell rather small, elongated fusiform, solid, with a moderately long canal. *Sculpture* consisting of subequal narrow spiral cords, about 10 on the penultimate whorl, the interspaces shallow, much broader than the cords upon the base, where they have a fine spiral thread; axial sculpture formed by numerous vertical broadly rounded ribs, 15 to 20 on the body-whorl, where they become obsolete below the periphery. *Colour* light-yellowish, the spirals reddish-brown. *Spire* elevated conic, of the same height as the aperture with canal; outlines straight. *Protoconch* of 2 smooth whorls, small and globose. *Whorls* 8, regularly increasing, convex, very lightly shouldered, the last somewhat inflated; base excavated. *Suture* not much impressed. *Aperture* large, oval, broadly angled above, produced below into a fairly long oblique and open canal, rounded at the base. *Outer lip* convex, sharp, lightly lirate inside. *Columella* subvertical, slightly concave. *Inner lip* narrow, spreading over the parietal wall, narrowed below, and forming the inner edge of the canal. *Operculum* unknown.

Diameter, 13 mm.; height, 34 mm. (type). Diameter, 14 mm.; height, 32 mm. (specimen from East Cape).

Animal unknown.

Type in the Mus. Hist. Nat., Paris.

Hab.—New Zealand (Q. & G.); Hauraki Gulf; East Cape.

Remark.—This is apparently a rare shell, and I have never seen a live specimen.

Fossil in the Miocene.

4. Siphonalia mandarina, Duclos, 1831. Plate 43, fig. 7.

Fusus mandarinus, Duclos, Mag. de Zool., 1831, pl. 8; Krauss, Südafrik. Moll., 1848, 110; Crit. List, 18; C.M.M., 8; Conch. Icon., iv, pl. 2, f. 8. *Neptunea* (*Austrofusus*) *mandarinus*, Ducl.: Kobelt, Conch. Cab., 1880, 137, pl. 44, f. 2, 3. *Siphonalia* (*Austrofusus*) *mandarina*, Ducl., Man. Conch. (1), iii, 138, pl. 56, f. 384; pl. 57, f. 385. *Fusus* (*Neptunea*) *mandarinus*, Ducl., Chall. Rep., xv, 200. *F. zelandicus*, Q. & G., Voy. Astrol., ii, 1833, 500, pl. 34, f. 4, 5; C.M.M., 8. *Neptunæa zealandica*, Quoy, M.N.Z.M., 50. *Fusus Rudolphi*, Dunker, Novitat., 1871, 128, pl. 43, f. 3, 4. *F. cinnamomeus*, Reeve, Conch. Icon., f. 46? *Cominella prolongata*, Sowerby, Journ. Conch., 1899, 248, pl. 5, f. 3. *Austrofusus mandarinus*, Ducl.: Martens, Die beschalten Gastrop. d. deutsch. Tiefsee Exped. "Valdivia," 10.

Shell large, fusiform, elongated, with rounded spirally grooved whorls, solid, canal long. *Sculpture* consisting of equidistant strong spiral cords, the grooves between them a little broader, with one or two finer cords, and sometimes with a few fine spiral threads on the lower part of the groove; some of the upper whorls are usually axially costate, the costæ oblique, broad, and rounded. *Colour* reddish-brown, the spirals darker; aperture white. *Epidermis* horny, produced into sharp bristles, but apparently easily lost. *Spire* conical, lower than the aperture with canal; outlines straight. *Protoconch* of 2 smooth convex whorls, globose, very variable in size. *Whorls* 9 to 10, first slowly then more rapidly increasing, the spire-whorls sometimes lightly shouldered, convex; base excavated. *Suture* impressed. *Aperture* slightly oblique, pyriform, angled above, with a fairly long and open canal, curved backward, and rounded at its base. *Outer lip* convex, thin and sharp, crenulated by the spiral sculpture, and lirate within. *Columella* oblique, arcuate. *Inner lip* extending as a thin glaze a little beyond the pillar and upon the parietal wall, narrowed below and running along the inner margin of the canal. *Operculum* rather small, oval, pointed, nucleus apical.

Diameter, 57 mm.; height, 127 mm. (large specimen). Diameter, 48 mm.; height, 105 mm. (specimen of 9 whorls).

Animal unknown.

Hab.—From Auckland to Banks Peninsula; 200 miles west of Cape Farewell, in 275 fathoms; Queen Charlotte Sound, in 10 fathoms ("Challenger" Exped.). Also coast of Natal.

Fossil in the Miocene and Pliocene.

5. Siphonalia valedicta, Watson, 1886. Plate 18, fig. 9.

Fusus valedictus, Watson, Chall. Rep., xv, pt. 42, 201, pl. 17, f. 7. *Siphonalia mandarina*, var. *valedicta*, Watson, Index, 72. *S. valedicta*, Wats.: Iredale, T.N.Z.I., xl, 383.

Shell strong, feebly ribbed, regularly spiralled, fusiform, attenuated, with a long body-whorl, a subscalar spire, a small mamillated apex,

and a protracted canal. *Sculpture:* Axials—there are on each whorl 10 or 12 short oblique riblets, which do not extend to either suture, and are rather flattish elongated tubercles than ribs; they are parted by shallow open furrows; down the spire they become feebler, and all but disappear on the last whorl; besides these riblets there are numerous coarsish lines of growth. Spirals—the surface is scored with distinct equal flat threadlets, pretty equally parted by flat shallow furrows three times their width; there are 9 or 10 on the penultimate whorl; they are absent immediately below the suture. *Colour* white, but the shell is bleached. *Spire* high, subscalar conical, nearly as high as the aperture with canal; outlines straight. *Protoconch* small, mamillary, the nucleus immersed, of $2\frac{1}{2}$ smooth rounded whorls. *Whorls* $8\frac{1}{2}$, shouldered, slightly concave below the suture, very little contracted into the lower suture, the last elongated and rounded; base long, contracted, concave. *Suture* linear, in a broad open depression. *Aperture* oval, oblique, bluntly pointed above, with an open, very oblique, longish canal in front. *Outer lip* strong and blunt, very feebly scored within, with long narrow teeth; from its insertion it retreats very much, here it is flattish; in the middle it runs straight in the line of the axis. *Columella* concave to the beginning of the canal, where it is angulated and has a twisted keel. *Inner lip* forming a thin glaze on the parietal wall, continued at the side of the canal. *Operculum* unknown. (Watson.)

Diameter, 22 mm.; height, 50·8 mm. (type).

Animal unknown.

Type in the British Museum.

Hab.—Two hundred miles west of Cape Farewell, in 275 fathoms; Otago Peninsula, a dead shell (Iredale).

Remarks.—This species is like the young of *S. mandarina*, but is narrower and more compact, wants the intermediate spiral threadlets, and has a much smaller protoconch.

Genus 2. Euthria, Gray, 1850.

Euthria, Gray, Fig. Moll. Anim., iv, 1850, 67. Type: *Murex corneus*, L.

Animal with the eyes near the outer bases of the tentacles. Central tooth of radula with 3 or 5 cusps, lateral teeth with 3 cusps, the median cusp shorter than the others.

Shell solid, moderately large, fusiform, more or less ventricose: spire rather high, conic or subconoidal; protoconch smooth, paucispiral, the nucleus papillate and slightly tilted; whorls convex below, depressed below the suture, always costulate at the apex, the last whorl about two-thirds of the total height; aperture ovate, with a narrow channel above, rapidly contracted below, with long recurved canal; outer lip sinuated above, lirate within; columella sinuous, convex in the middle, with a plait or ridge below. Operculum oval, oblong, slightly arched, acuminated, with apical nucleus.

Distribution.—Mediterranean, Japan, California. South America, Falkland Islands, New Zealand, Kerguelen, South Africa. This is a distinctly southern genus.

Fossil in the Tertiary ; abundant in the Miocene of Europe.

KEY TO SPECIES.

A. Shell uniformly white or light brown, without coloured spiral bands.
  a. Shell distinctly spirally ridged, spire of the same height as the aperture with canal .. .. *striata.*
  aa. Shell inconspicuously spirally striate, spire higher than the aperture with canal .. .. *Martensiana.*
B. Shell with coloured spiral bands.
  a. Spiral bands orange.. .. .. *flavescens.*
  aa. Spiral bands purple.
    b. Body-whorl with 2 broad purple bands .. .. *vittata.*
    bb. Whorls with numerous narrow purple bands.
      c. Shell rather large, height about 40 mm., spirals distant, height of spire a little less than that of the aperture with canal .. .. *linea.*
      cc. Shell smaller, height 25 to 30 mm.
        d. Spiral ridges not very prominent, the shell almost smooth, not very thick .. *littorinoides.*
        dd. Spiral ridges distinct, especially on the base ; shell more solid, the close purple bands inconspicuous or absent .. .. *Strebeli.*

1. Euthria flavescens, Hutton, 1884. Plate 44, fig. 19.

Pisania flavescens, Hutt., T.N.Z.I., xvi, 1883 (1884), 230. *Euthria lineata*, var. D, Hutton, M.N.Z.M., 51. *E. flavescens*, Hutt., Index, 73.

Shell rather small, ovate-fusiform, banded with orange and spirally striate, solid. *Sculpture* consisting of low flat spiral riblets, much more raised upon the base, with narrow interstices ornamented with 1 or several fine spiral threads ; a few whorls below the protoconch axially costate ; growth-lines distinct, almost straight. *Colour* white with orange spiral bands, aperture banded with yellowish-brown within, inner lip of the same colour. *Spire* elevated conical, its height equal to that of the aperture with canal ; outlines very slightly convex. *Protoconch* minute, of 2 smooth whorls, papillate. *Whorls* 7, the upper ones slowly increasing, the last high, somewhat depressed below the suture, thence lightly convex ; base contracted. *Suture* impressed, but not deep. *Aperture* a little oblique, oval, channelled above, with an oblique, recurved, rather short, and widely open canal below, notched at its base. *Outer lip* somewhat expanded, convex, sharp, much thickened and lirate within. *Columella* vertical, slightly arcuate, with a few small plaits at its base. *Inner lip* thin, not broad, spreading lightly over the body-whorl, with a small plait rather far below the suture ; towards the end of the canal the lip is drawn out to a fine point. *Fasciole* very prominent, lamellate. *Operculum* horny, yellowish-brown, oval, nucleus apical.

Diameter, 13 mm. ; height, 27 mm. Angle of spire, 45°.

Dentition.—Hutton, T.N.Z.I., xvi, pl. 11, f. 3.

Type in the Canterbury Museum, Christchurch.

Hab.—Dunedin (type) ; Akaroa Harbour, between tide-marks (H. S.).

2. **Euthria linea**, Martyn, 1784. Plate 44, fig. 20.

Buccinum linea, Mart., Un. Conch., ii, 1784, f. 48. *Fusus lineatus*, Q. & G., Voy. Astrol., ii, 501, pl. 34, f. 6–8. *Pollia linea*, Mart. : Gray, Dieff. N.Z., 229. *Fusus linea*, Mart. : Hutton, C.M.M., 10. *Euthria lineata*, Chemn. : Hutton, J. de Conch., 1878, 15 ; M.N.Z.M., 51. *Pisania lineata*, Mart. : Hutton, T.N.Z.I., xvi, 229. *Euthria lineata*, Mart., Man. Conch. (1), iii, 151, pl. 72, f. 229–31.

Shell fusiform, solid, mostly smooth, but the apical whorls costate, ornamented with distant spiral purple bands. *Sculpture :* The surface is mostly smooth or shows fine microscopic striation, but occasionally the purple lines are slightly ridged ; the protoconch is smooth, but the following two or three whorls are axially costate. *Colour* yellowish-white, purplish, or pale reddish-brown, spirally distantly and narrowly banded with purplish-black ; these bands are sometimes unequally spaced, and their number on the penultimate whorl varies from 4 to 6 ; fasciole on the neck sometimes dark brown ; aperture bluish-white within ; outer lip with brown liræ, and occasionally clouded with brown. *Spire* elevated conical, height a little less than that of the aperture with canal ; outlines almost straight. *Protoconch* of 2 smooth whorls, globular and small. *Whorls* about 8, first slowly increasing, the last very high, flatly convex, slightly depressed below the suture ; base contracted, concave. *Suture* superficial, linear. *Aperture* slightly oblique, narrowly oval, channelled above, produced below into an oblique recurved and open canal, slightly notched at its base. *Outer lip* convex, sinuate on approaching the canal, sharp, thickened within, and with numerous fine teeth at some distance from the edge. *Columella* arcuate, with a few tubercles below. *Inner lip* spreading some distance upon the pillar, and as a thin callus over the parietal wall, which bears 1 or 2 tubercles below the suture ; the lip is narrowed and drawn out to a long point below, forming the inner margin of the canal. *Fasciole* distinct, slightly lamellar. *Operculum* horny, yellowish, oval and unguiculate, nucleus apical.

Diameter, 19 mm. ; height, 40 mm. Angle of spire, 48°.

Animal having moderately long and slender tentacles, the eyes near their extremities ; foot oval ; colour light yellow, with reddish-brown spots prominent on the head, tips of the tentacles, and round the foot.

Dentition.—Troschel, Das Gebiss d. Schnecken, ii, 79, pl. 7, f. 12 ; Man. Conch. (1), iii, pl. 27, f. 28 : Hutton, T.N.Z.I., xv, 119, pl. 13, f. H.

Type lost.

Hab.—North and South Islands, but more common in the North; Chatham, Antipodes, Auckland, and Campbell Islands. Brought to England by Captain Cook.

Fossil in the Miocene and Pliocene.

Subsp. pertinax, von Martens, 1878. Plate 46, fig. 12.

Euthria lineata, var. *pertinax*, v. Mts., Sitzber. Naturf. Fr. Berlin, 1878, 23. *E. lineata*, var. A, Hutton, M.N.Z.M., 51. *Pisania lineata*, var. *pertinax*, v. Mts.: Hutton, T.N.Z.I., xvi, 229. *Euthria lineata*, var. *pertinax*, v. Mts., Man. Conch. (1), iii, 151.

Shell more ventricose, axial costæ extending over the antepenultimate whorl; colour-bands less numerous.

Height, 68 mm.

Type in the Naturhist. Museum, Berlin.

Hab.—Foveaux Strait; Banks Peninsula; Hauraki Gulf. The type is from the Auckland Islands.

Subsp. Traversi, Hutton, 1873. Plate 46, fig. 13.

Fusus Traversi, Hutt., C.M.M., 9. *Neptunea Traversi*, Hutt., J. de Conch., 1878, 14; M.N.Z.M., 51. *Euthria lineata*, var. B, *l.c.*, 51. *Pisania lineata*, var. *Traversi*, Hutt., T.N.Z.I., xvi, 229. *Siphonalia Traversi*, Hutt., Man. Conch. (1), iii, 137.

Shell somewhat more ventricose, axial ribs extending over all the whorls. Operculum as in the species.

Diameter, 15 mm.; height, 28 mm. (type). Specimen from Foveaux Strait, 20 mm. by 38 mm.

Type in the Dominion Museum, Wellington.

Hab.—Chatham Islands (type); Stewart Island; Cook Strait.

Fossil in the Pliocene.

3. Euthria littorinoides, Reeve, 1846. Plate 44, fig. 21.

Buccinum littorinoides, Reeve, Conch. Icon., iii, pl. 12, f. 94. *Fusus* (*Euthria*) *littorinoides*, Reeve: v. Martens, Crit. List, 19. *Euthria littorinoides*, Reeve: Hutton, J. de Conch., 1878, 16; M.N.Z.M., 52. *E. lineata*, var. *littorinoides*, Reeve: Tryon, Man. Conch. (1), iii, 151, pl. 72, f. 231. *Pisania littorinoides*, Reeve: Hutton, T.N.Z.I., xvi, 230. *Euthria lineata*, Mart., var. C, Hutton, M.N.Z.M., 51.

Shell fusiform, rather small, solid, spirally narrowly banded with purple. *Sculpture* consisting of close and narrow spiral ridges, the slightly broader interstices with 1 or 2 fine spiral threads; sometimes the spiral ridges are absent, and the whole shell is only very finely spirally striate; the two or three whorls succeeding the protoconch are axially costate. *Colour* greyish or yellowish-white, with narrow dark-purple spiral bands, 5 to 7 on the penultimate whorl; aperture light brown or purple within; the outer lip sometimes with brown liræ, and occasionally with a few brown patches. *Spire* elevated conic, of about the same height as the aperture with the canal; outlines faintly convex. *Protoconch* very small, of 2 convex and smooth whorls.

Whorls 7, first slowly increasing, the last high, lightly convex, and somewhat depressed below the suture; base contracted. *Suture* not much impressed. *Aperture* subvertical, narrowly ovate, channelled above, produced below into an oblique, moderately long, and open canal, notched at the base. *Outer lip* convex, with a fairly sharp edge, much thickened and dentate inside in quite adult specimens. *Columella* vertical, arcuate, with a few small tubercles below. *Inner lip* narrow upon the pillar, extending over the parietal wall, which has usually a distinct tubercle below the suture; narrowed below, and forming the inner margin of the canal, which is slightly recurved. *Fasciole* distinct, slightly lamellate; sometimes there is a narrow groove between it and the inner lip. *Operculum* normal.

Diameter, 11 mm.; height, 24 mm.; angle of spire, 48–50°. Diameter, 15 mm.; height, 29 mm.

Dentition.—Troschel, Das Gebiss d. Schnecken, pl. 7, f. 12; Hutton, T.N.Z.I., xiv, 162, pl. 6, f. D (as of *E. lineata*).

Animal.—T.N.Z.I., xiii, 201.

Type in the British Museum.

Hab.—North and South Islands; Chatham Islands; Auckland Islands. The type was collected in New Zealand by Earl.

Remarks.—This species also is very variable, some specimens showing affinities with *E. linea*, others with *E. vittata*. The shells from the Hauraki Gulf are mostly spirally distinctly ridged, and the ridges much closer together, whilst those of the South Island are generally smooth, with fine spiral threads only, and the spiral purple bands further apart.

Fossil in the Pliocene.

Subsp. **costulata**, n. subsp.

Distinguished from the species by having the spire-whorls, protoconch excepted, axially costate, the costæ sometimes extending over the body-whorl as well; they are broadly rounded, and their number is about 18 on the penultimate whorl. Otherwise the subspecies does not differ from the species.

Type in my collection.

Hab.—Great Barrier Island (type); Kenepuru Sound.

4. **Euthria Martensiana**, Hutton, 1878. Plate 44, fig. 22.

Euthria Martensiana, Hutt., J. de Conch., 1878, 16. *Fusus littorinoides*, Reeve: Hutton, C.M.M., 10; not of Reeve. *Euthria Martensiana*, Hutt., M.N.Z.M., 52. *Pisania Martensiana*, Hutt., T.N.Z.I., xvi, 230. *Euthria Martensiana*, Hutt.: Tryon, Man. Conch. (1), iii, 151; Index, 73.

Shell rather small, elongate, fusiform, very thin, with rather inconspicuous spiral sculpture, except upon the base. *Sculpture* consisting of indistinct distant spiral ridges, with numerous fine spiral

threads between them ; sometimes these ridges can hardly be distinguished on the spire-whorls from the prevalent fine striation, but on the base they are gradually becoming very distinct, their number being about 6 below the suture ; three to five whorls below the protoconch are distinctly axially costate, the costæ straight, broadly rounded, continuous over the whorls ; growth-lines fine and dense, slightly reticulating the spiral threadlets. *Colour* yellowish-brown, no colour-markings of any kind. *Spire* narrowly conical, higher than the aperture with canal ; outlines lightly convex. *Protoconch* minute, papillate, of 1 smooth and 1 costate whorl, brown. *Whorls* 7 to 8, first slowly increasing, the last high, slightly depressed below the suture, thence flatly convex ; base contracted, concave. *Suture* lightly impressed. *Aperture* subvertical, oval, subchannelled above, produced below into an oblique, rather short, slightly recurved, and widely open canal ; the base notched. *Outer lip* thin and sharp, mostly smooth or only indistinctly lirate inside. *Columella* vertical, very little arcuate, basal tubercles obsolete. *Inner lip* thin and rather narrowly spread over the columella, extending as a very thin layer over the parietal wall, which has only a very inconspicuous plait below the suture ; lip narrowed below. *Fasciole* distinct, lamellate. *Operculum* oval, horny, nucleus apical.

Diameter, 7·5 mm. ; height, 18 mm. (type). Angle of spire, 36°.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Near Wellington (T. W. Kirk).

Remark.—A very local and distinct species.

5. Euthria Strebeli, Suter, 1908. Plate 18, fig. 10.

Euthria Strebeli, Suter, T.N.Z.I., xl, 1907 (1908), 369, pl. 30, f. 4. *E. antarctica*, Reeve : Hutton, M.N.Z.M., 52 ; Index, 73. *Pisania antarctica*, Reeve : Hutton, T.N.Z.I., xvi, 231 ; not of Reeve.

Shell not large, fusiform, very solid, usually spirally ridged. *Sculpture* consisting of numerous narrow spiral ridges, much more prominent upon the base, the interstices with fine spiral threads ; two or three whorls below the protoconch are axially costate ; growth-lines oblique, fine. *Colour* whitish or cinereous, very often with light-brown narrow spiral bands ; aperture purplish-brown within ; outer lip white or with a few brown patches ; sometimes the whole shell is covered by a blackish coating. *Spire* elevated conic, height almost that of the aperture with the canal ; outlines but little convex. *Protoconch* minute, of 2 smooth and convex whorls. *Whorls* 8, first slowly increasing, the last high ; they are very lightly convex, depressed below the suture ; the base contracted. *Suture* not much impressed. *Aperture* very little oblique, narrowly oval, distinctly channelled above, produced below into a moderately long, recurved, and open canal, notched at the base. *Outer lip* flatly convex, sharp, much thickened inside, and

distinctly toothed. *Columella* vertical, arcuate, with a number of tubercles at the base. *Inner lip* rather narrow upon the pillar, extending over the parietal wall, which has a well-marked plait below the suture; the lip is narrowed below, forming the inner edge of the canal. *Fasciole* prominent, lamellate; a narrow groove between it and the edge of the canal. *Operculum* horny, yellowish, the nucleus apical.

Diameter, 15 mm.; height, 28 mm. Angle of spire, 47–50°.

Animal unknown.

Type in my collection.

Hab.—Dunedin Harbour, type (H. S.); Lyttelton Harbour (H. S.); Preservation Inlet; Auckland Islands.

6. **Euthria striata**, Hutton, 1875. Plate 45, fig. 1.

Cominella striata, Hutton, T.N.Z.I., vii, 1874 (1875), 458, pl. 21. *Pisania striata*, Hutton, T.N.Z.I., xvi, 230; not of Gmelin. *P. striatula*, Hutt., Plioc. M., 42, pl. 6, f. 12. *Euthria striata*, Hutt., Index, 73.

Shell fusiform, rather small, white without colour-markings, spirally lirate. *Sculpture* consisting of equidistant, narrow, and flatly rounded spiral ridges, the interspaces with fine spiral threads, one of them usually more prominent; whorls below the protoconch with broadly rounded axial ribs, extending sometimes over all the spire-whorls; growth-lines distinct, close together, somewhat flexuous. *Colour* pale yellowish-brown, but mostly of a dirty-white; aperture white inside. *Spire* conical, about the same height as the aperture with canal, sometimes a little less; outlines straight or lightly convex. *Protoconch* very small, papillate, of 2 smooth convex whorls. *Whorls* 6 to 7, first slowly increasing, the last high, flattish or somewhat rounded, flattened below the suture; base contracted, concave. *Suture* impressed. *Aperture* subvertical, oval, channelled above, with a moderately long oblique canal below, which is recurved, open, and notched at the base. *Outer lip* convex, rather blunt, thickened and toothed in quite adult specimens. *Columella* vertical, slightly concave, with a few small tubercles below. The *inner lip* rather broadly extended over the pillar, forming but a thin callosity upon the parietal wall, which has 1 or 2 plaits below the suture; below the lip is narrowed, drawn out to a fine point about half-way down the margin of the canal. *Operculum* horny, yellowish-brown, oval, the nucleus apical.

Diameter, 15 mm.; height, 29 mm. Angle of spire, 45°.

Dentition.—Hutton, T.N.Z.I., xvi, pl. 11, f. 3.

Type, from the Pliocene of Wanganui, in the Otago Museum, Dunedin.

Hab.—Lyttelton Harbour; Te Onepoto Bay, near Sumner (H. S.); Bluff (Mrs. Bollons); Preservation Inlet; Chatham Islands.

Remark.—Recent specimens have the spiral ridges usually not so acutely raised as fossil shells.

Fossil in the Pliocene.

7. **Euthria vittata,** Quoy and Gaimard, 1833. Plate 45, fig. 2.

Fusus vittatus, Q. & G., Voy. Astrol., ii, 1833, 504, pl. 34, f. 18, 19; Gray, Dieff. N.Z., 230; Hutton, C.M.M., 10; v. Martens, Crit. List, 19. *Euthria vittata*, Q. & G.: Hutton, J. de Conch., 1878, 15; M.N.Z.M., 51; Tryon, Man. Conch. (1), iii, 152, pl. 72, f. 235, 236. *Pisania vittata*, Q. & G.: Hutton, T.N.Z.I., xvi, 230. *Buccinum trilineatum*, Reeve, Conch. Icon., iii, 1846, f. 98. *Fusus bicinctus*, Hutton, C.M.M., 10. *Euthria bicincta*, Hutton, J. de Conch., 1878, 15; M.N.Z.M., 52; Tryon, Man. Conch. (1), iii, 152, pl. 72, f. 234.

Shell rather small, fusiform, solid, smooth or spirally ridged, typically with 2 broad purple bands on the body-whorl. *Sculpture* consisting of fine spiral striæ, but sometimes spiral ridges are present, which are more prominent upon the base; a few whorls below the protoconch are axially costate, but occasionally they extend to the penultimate whorl. *Colour* yellowish-brown, with or without fine distant brown spiral bands; spire-whorls with a broader purple band close above the suture, and 2 on the body-whorl; the coloured bands, however, are often absent; aperture purple inside, sometimes streaked brown and white on the outer lip. *Spire* elevated conic, of about the same height as the aperture and canal; outlines straight. *Protoconch* small, of 2 smooth whorls, papillate. *Whorls* 7 to 9, depressed below the suture, thence flatly convex, the last high; base contracted, concave. *Suture* linear, superficial. *Aperture* subvertical, oval, narrowly channelled above, produced below into a short, recurved, widely open canal, notched at the base. *Outer lip* very little thickened, sharp, smooth or lightly lirate within. *Columella* vertical, arcuate, with a few tubercles below. *Inner lip* narrowly spread upon the pillar, extending thinly over the parietal wall, which has a low tubercle below the suture; narrowed and extending to the canal below, sometimes leaving a depression between the canal and the fasciole, which is distinct and lamellate. *Operculum* normal.

Diameter, 8·5 mm.; height, 19 mm. (type); angle of spire, 37°. Diameter, 16 mm.; height, 34 mm. (Chatham Islands specimen).

Animal having the tentacles moderately long, the eyes near their extremities; the foot is small, oval, yellowish-white like the head; these parts are marked with elongated reddish-brown spots; of these, there are 2 on the head and a third is encircling the tentacles above the eyes.

Dentition.—Hutton, T.N.Z.I., xv, 120, pl. 13, f. 1.

Type in the Mus. Hist. Nat., Paris.

Hab.—Bay of Islands (type); Hauraki Gulf, rather common; Kawhia; Lyttelton, Sumner, Little Akaloa (H. S.); Chatham Islands; Auckland Islands.

Remarks.—This species shows a considerable variation, and perfect albinos are not rare in the Hauraki Gulf. Specimens from the south are considerably larger, and the colour-markings are much more pronounced. The largest and distinctly banded specimens occur at the Chatham Islands.

Quoy and Gaimard already remarked that the shells are very often perforated all over by minute holes, and I observed this not only in this species, but in most of the others of the genus, especially from the North Island. It seems likely that these perforations are produced by a boring sponge.

Fam. **BUCCINIDÆ**, Fleming.

Animal having a large and broad foot, truncated in front; eyes at the bases of the tentacles; siphon long. Central tooth of radula with 3 to 6 cusps, lateral teeth generally tri- or bi-cuspidate.

Shell oval or oblong; canal very short, almost nil, deeply notched at its base, corresponding to which there is a fasciole upon the neck, produced by growth-periods of the notch; aperture ample; columella generally excavated, more or less twisted below, smooth or ridged. Operculum horny.

Distribution.—World-wide.

Fossil.—Cretaceous and Tertiary.

Subfam. 1. COMINELLINÆ.

Notch on the base of the canal very deep; fasciole forming a strong carina upon the neck.

Genus 1. COMINELLA (Gray, MS.), H. and A. Adams, 1853.

Cominella, H. & A. Ad., G.B.M., i, 110, 1853. Type: *C. virgata*, H. & A. Ad.

Animal having an oblong foot, truncated in front, attenuated behind; tentacles flattened, subulate, moderately long, with the eyes at the lower third on their outer sides; siphon long; male organ very large and thick. Central tooth of radula with 3 to 7 cusps, lateral teeth with 2 to 4 cusps.

Shell solid, of medium size, ovoid-conic; spire not very high, regularly conic; protoconch obtuse, nucleus rounded and but little raised; whorls convex, grooved below the suture, ornamented with axial ribs (sometimes obsolete) and spiral liræ; the last whorl large, ventricose; aperture oval, widened in the middle, conspicuously channelled above, with a very short and widely open canal below, deeply notched at its base; outer lip rather sharp, thickened and toothed inside, contracted above below the suture; columella moderately excavated, smooth, twisted below; inner lip large and callous, extended over the umbilical tract; fasciole high and thick, with a carina on the outside. Operculum horny, ovoid, nucleus apical.

The genus is confined in its distribution to the Southern Hemisphere—Magellan, Kerguelen, south and south-west of Australia, Tasmania, Auckland and Campbell Islands, New Zealand, South Africa, St. Helena.

Fossil in the Upper Cretaceous and Tertiary.

Key to Species.

A. Axial costæ extending over the upper whorls only.
  a. Shell turgid, spire half or three-quarters the height of the aperture .. .. *maculata.*
  aa. Shell fusiform or elongately oval.
    b. Shell spirally lirate or finely striate.
      c. Shell large and heavy, height 40–55 mm., tessellated or with interrupted bands of purple .. *maculosa.*
      cc. Shell smaller, height 30–35 mm., with uninterrupted brown bands.
        d. Spiral bands about 15 on body-whorl .. *Quoyi.*
        dd. Spiral bands about 7–8 on body-whorl .. *vittata.*
    bb. Spiral sculpture absent or inconspicuous .. .. *Campbelli.*

B. Axial costæ extending down the spire over the body-whorl.
  a. Spire higher than the aperture, costæ extending to the suture above, 14 on the penultimate whorl .. .. .. *Huttoni.*
  aa. Spire of about the same height as the aperture.
    b. Shell without colour-markings.
      c. Axial costæ about 18 on the penultimate whorl, shoulder with a series of tubercles below the suture .. .. *nassoides.*
      cc. Axial costæ about 12 on the penultimate whorl, shoulder smooth below the suture .. .. *lurida.*
    bb. Shell with colour-markings.
      c. Shell fusiform, cinguli of irregular width, shoulder distinct, concave .. .. *costata.*
      cc. Shell elongately oval, cinguli alternately broad and narrow, shoulder indistinct, not concave .. *zealandica.*

1. **Cominella Campbelli**, Filhol, 1880. Plate 45, fig. 3.

Buccinum Campbelli, Filh., Compt. Rend., xci, 1880, 1094; Miss. I.C., 524.

Shell fusiform, solid, almost smooth, olive-brown. *Sculpture:* Some specimens show traces of distant spiral striæ, but usually the surface is smooth on the lower whorls; two or three whorls below the protoconch are axially costate. *Colour* greyish or olive-brown, the aperture dark purple within, the lips greenish or yellowish-white. *Spire* conical, of the same height as the aperture; outlines lightly convex. *Protoconch* small, of 2 smooth whorls, papillate. *Whorls* 7 to 8, moderately convex, a little depressed below the suture, the last high; base contracted. *Suture* superficial. *Aperture* a little oblique, oval, wide in the middle, channelled above, with a short, somewhat oblique, widely open, and not very deeply notched canal. *Outer lip* somewhat contracted above, distinctly sinuate, expanded, sharp, thickened and smooth inside. *Columella* vertical, almost straight, smooth. *Inner lip* thin and narrow upon the pillar, spreading over the parietal wall, which has a low tubercle below the suture; narrowed below and twisted. *Fasciole* not very prominent. *Operculum* horny, very thin and translucent, nucleus apical.

Diameter, 14 mm.; height, 29 mm. (type). Diameter, 18 mm.; height, 33 mm. (largest specimen in my collection).

Dentition similar to that of *maculata*, *maculosa*, and *virgata*, figured by Hutton; the central tooth tricuspid, laterals with two cusps, the inner one slightly shorter.

Type in the Mus. Hist. Nat., Paris.

Hab.—Campbell Island; between tide-marks on rocks and seaweeds in Perseverance Bay (Filhol, Captain Bollons).

2. Cominella costata, Quoy and Gaimard, 1833. Plate 45, fig. 4.

Buccinum costatum, Q. & G., Voy. Astrol., ii, 1833, 417, pl. 30, f. 17, 18; Reeve, Conch. Icon., iii. f. 20. *Cominella costata*, Q. & G.: Tryon, Man. Conch. (1), iii, 205, pl. 81, f. 430, 434; Suter, T.N.Z.I., xxxviii, 330; Iredale, T.N.Z.I., xl, 383. *Buccinum eburneum*, Reeve, Conch. Icon., f. 93. *Cominella Angasi*, Crosse, J. de Conch., 1864, 275, pl. 11, f. 5 (a dark variety).

Shell rather small, fusiform, with an acute turreted spire, spirally grooved and axially costate, solid. *Sculpture* consisting of flattish cinguli, narrower on the shoulder, broader below it, the interstices consisting of narrow grooves; upon the base the cinguli are usually slightly raised and rounded, the interspaces broader; axial sculpture formed by broad rounded axial ribs, sometimes continuous over the whorls, much raised at the carina of the shoulder and below it; they extend over all whorls, getting obsolete on the base; the spiral sculpture continued over the ribs, which number about 12 on the penultimate whorl. *Colour* yellowish-brown or cinereous, tesselated with revolving series of reddish-brown oblong spots, sometimes confluent into lines; aperture light purple or whitish within; lip and columella fawn-colour. *Spire* elevated conic, turreted, of the same height as the aperture; outlines straight. *Protoconch* minute, globular, of $1\frac{1}{2}$ smooth whorls. *Whorls* 7, the last high, nodulously keeled, slightly concave on the shoulder, somewhat convex below; base a little contracted. *Suture* not deep, sinuous. *Aperture* subvertical, narrowly oval, channelled above, with a slightly oblique wide-open canal below, its base deeply notched. *Outer lip* sharp, lightly sinuated, thickened inside, smooth or lirate. *Columella* vertical, very little concave, stout, and broadly rounded. *Inner lip* spread broadly over the columella and over the parietal wall, which bears a distinct callosity close to the suture; below the lip is narrowed to a lamella, forming the inner margin of the canal. *Fasciole* prominent, keeled on the outside. *Operculum* horny, oval, dark brown, with an apical nucleus.

Diameter, 12·7 mm.; height, 29·5 mm. (type).

Dentition unknown.

Type in the Mus. Hist. Nat., Paris.

Hab.—A specimen from New Zealand, which I have seen, is in the British Museum. Shag Point (Iredale). The type is from King George Sound, Australia.

Fossil in the Pliocene.

3. Cominella Huttoni, Kobelt, 1878. Plate 45, fig. 5.

Cominella Huttoni, Kobelt, Jahrb. d. Deutsch. Mal. Ges., 1878, 233. *Buccinum costatum*, var., Q. & G., Voy. Astrol., pl. 30, f. 19, 20. *Cominella Quoyana*, A. Ad., P.Z.S., 1854, 313; not *C. Quoyi*, Kiener. *C. Huttoni*, Kob.: Hutton, M.N.Z.M., 54; T.N.Z.I., xvi, 232.

Shell small, fusiform, solid, with fine spiral grooves and prominent axial costæ, turreted, cinereous. *Sculpture* consisting of broad and flat cinguli, with linear interspaces; they are either smooth or ornamented with fine spiral threads, the last on the body-whorl is usually narrower and rounded, 5 on the penultimate and 9 to 10 on the body-whorl; the axial sculpture consists of straight, thick, and rounded ribs, very low on the shoulder, extending over all the whorls below the protoconch and over part of the base; the interstices of the same width as the ribs, the number of which is about 14 on the penultimate whorl. *Colour* pale brown or whitish, sometimes marbled with reddish-brown; spiral grooves brown; aperture and the lips white. *Spire* elevated conic, turreted, higher than the aperture; outlines straight. *Protoconch* minute, papillate, light brown, of $2\frac{1}{2}$ smooth whorls. *Whorls* 7 to 8, first slowly increasing, with a narrow and slightly concave shoulder, lightly convex below; base flattish, but little contracted. *Suture* impressed, lightly wavy. *Aperture* subvertical, oval, channelled above, with a short, widely open, and deeply notched canal below. *Outer lip* angled above, thence convex, sharp, somewhat thickened and minutely denticulate within. *Columella* vertical, arcuate, smooth. *Inner lip* narrow, extending over the parietal wall, which bears a small tubercle below the suture, drawn out to a long and narrow point below. *Fasciole* prominent, keeled. *Operculum* horny, dark brown, oval, nucleus apical.

Diameter, 10 mm.; height, 23 mm.

Animal having slender tentacles, with the eyes near the middle.

Dentition unknown.

Type in the British Museum.

Hab.—From Cape Maria van Diemen to East Cape, low-water mark to 25 fathoms; Kermadec Islands.

Fossil in the Miocene and Pliocene.

4. Cominella lurida, Philippi, 1848. Plate 45, fig. 6.

Buccinum luridum, Phil., Zeitschr. Malac., 1848, 137; Abbild. & Beschr., iii, 46, pl. 1, f. 10. *Cominella lurida*, Phil.: Hutton, J. de Conch., 1878, 19; M.N.Z.M., 54; T.N.Z.I., xvi, 233. *Buccinum funereum*, Gould, P. Bost. Soc. N.H., 1850, 152; U.S. Expl. Ex., f. 320. *Cominella funerea*, Gould: Hutton, J. de Conch., 1878, 18; M.N.Z.M., 54. *Buccinum zelandicum*, Hombr. & Jacq., Voy. P.S., v, 74, pl. 21, f. 5, 6; not of Reeve. *B. costatum*, Quoy: Hutton, C.M.M., 14; not of Quoy. *B. lævigatum*, Hutt., C.M.M., 14.

Shell small, ovate, fairly solid, spirally lirate and axially costate, whorls shouldered. *Sculpture* consisting of flat spiral liræ, the interspaces linear; axial costæ are present on all the whorls, protoconch

excepted, but extending only from the angle of the shoulder to the suture, and are effaced on the base of the body-whorl; the angle of the spire-whorls is mostly strongly nodulous. *Colour* brown or purplish, mostly coated with green or grey; aperture dark brown within; outer lip yellowish; inner lip brown, sometimes mottled with yellow. *Spire* elevated conic, in height equal to that of the aperture, sometimes a little higher; outlines somewhat convex. *Protoconch* of $1\frac{1}{2}$ smooth whorls; nucleus minute, raised. *Whorls* 7 to 8, shouldered, concave above the angle, flatly rounded below, the last high; base contracted. *Suture* well impressed, but not deep. *Aperture* subvertical, oval, channelled above, with a short, widely open, and deeply notched canal below. *Outer lip* sinuate and contracted above, convex further down, sharp, smooth within. *Columella* vertical, lightly excavated, broadly rounded. *Inner lip* moderately broad, smooth, forming a thin layer on the parietal wall, which has but a very low plait below the suture; narrowed below, twisted, and forming the inner margin of the canal as a thick lamella. *Fasciole* distinct, mostly very prominently keeled on the outside. *Operculum* horny, oval; nucleus apical, dark brown.

Diameter, 13 mm.; height, 24·5 mm. (specimen of 7 whorls). Diameter, 18 mm.; height, 37 mm. (large example, of 8 whorls).

Dentition.—Hutton, T.N.Z.I., xiv, 162, pl. 6, f. C.

Hab.—A most plentiful shell throughout New Zealand, on mud-flats. *Zostera* beds, and in brackish water.

Fossil in the Pliocene.

5. **Cominella maculata**, Martyn, 1784. Plate 45, fig. 7.

Buccinum maculatum, Mart., Un. Conch., ii, 1784, f. 49. *Purpura maculata*, Gray, in Yate N.Z., 308. *Buccinum (Cominella) maculatum*, Mart.: Hutton, C.M.M., 14; Reeve, Conch. Icon., iii, pl. 3, f. 16. *Cominella maculata*, Mart.: v. Martens, Crit. List, 19; Ad. G.R.M., pl. 11, f. 6*a*, 6*b*; Kobelt, Jahrb. Deutsch. Mal. Ges., 1878, 233; Hutton, M.N.Z.M., 53; T.N.Z.I., xvi, 231; Tryon, Man. Conch. (1), iii, 204, pl. 81, f. 421–24. *Buccinum adspersum*, Brug., Encycl. Méth., i, 1789, 265. *B. turgidum*, Gmel., Syst. Nat., ed. xiii, i, 1790, 3641. *Purpura turgida*, Gmel.: Gray, Dieff. N.Z., 234. *Buccinum testudineum*, Lam., var., Voy. Astrol., pl. 30, f. 12.

Shell moderately large, tumid, solid and heavy, almost smooth or spirally lirate, aperture yellow within. *Sculpture:* Very frequently the spiral liræ are obsolete, the shell smooth, except for growth-lines and axial costæ on the upper whorls, but just as often the shell is ornamented with prominent spiral ribs, unequal and inequidistant, with narrow interspaces, but distant on the base, 9 to 10 on the penultimate whorls; in well-preserved specimens the four whorls succeeding the protoconch have broadly rounded elevated axial ribs, about 14 on a whorl; growth-lines more or less distinct, flexuous, sometimes rib-like. *Colour* mostly uniformly chocolate-brown, sometimes cinereous, but rarely is the shell yellowish-white, with the cinguli dark

brown and broken up into spots by incremental furrows; aperture within light to orange yellow, the outer lip sometimes with brown liræ. *Spire* exceedingly variable in its development: it may be low and conoidal, the height not more than half the height of the aperture, and the outlines concave; or it may be more elevated, broadly conic, its height about three-fourths that of the aperture, and the outlines straight or even a little convex. *Protoconch* of $1\frac{1}{2}$ smooth convex whorls; the nucleus small, pointed, a little raised. *Whorls* about 7 to 8, first slowly increasing, the last high and ventricose, moderately convex; base flatly convex, contracted above the fasciole. *Suture* impressed, uneven. *Aperture* subvertical, oblique, strongly channelled above, below with a short widely open and slightly oblique canal, its base deeply notched. *Outer lip* lightly convex, sinuated above the middle, thickened inside, edge fairly sharp, sometimes slightly denticulate, but mostly quite smooth. *Columella* vertical, slightly concave, stout and broadly rounded, twisted below and angularly truncated. *Inner lip* broad and thickly callous, polished, spreading over the parietal wall, which bears a stout broadly rounded callus below the suture; at the base the lip is narrowed to a strong lamella, which forms the inner margin of the canal. *Fasciole* very prominent, high and broad, carinated, leaving very often a deep umbilical depression. *Operculum* horny, dark brown, concentrically lamellate, nucleus apical.

Diameter, 29 mm.; height, 46 mm. Diameter, 31 mm.; height, 41 mm. Diameter, 35 mm.; height, 59 mm.

Dentition.—Troschel, Das Gebiss d. Schnecken, ii, 83, pl. 8, f. 3; Hutton, T.N.Z.I., xv, 120, pl. 13, f. L.

Type lost.

Hab.—Hauraki Gulf, common between tide-marks and to about 5 fathoms; Wellington Harbour; Pelorus Sound. Also Chatham and Auckland Islands (*teste* Hutton). Brought to England by Captain Cook.

Fossil in the Miocene and Pliocene.

Maori.—Kawari (*fide* Captain Bollons).

Subsp. **melo**, Lesson, 1840.

Buccinum melo, Less., Revue Zool., 1840, 355. Less.: Gray, Dieff. N.Z., 232. *Cominella melo*, Less.: Hutton, M.N.Z.M., 54.

Distinguished from the species in being heavier and more turgid, the spiral sculpture is faint or absent, only flexuous rugose growth-periods irregularly costulate the shell. The colour is uniformly chocolate-brown, the inside of the aperture vividly orange. Spire conoidal, concave, barely half the height of the aperture. There is always a distinct umbilical chink present.

Diameter, 34 mm.; height, 50 mm.

Type in the Mus. Hist. Nat., Paris.

Hab.—Whangaroa Harbour (Captain Bollons).

6. **Cominella maculosa,** Martyn, 1784. Plate 45, fig. 8.

Buccinum maculosum, Mart., Un. Conch., i, 1784, f. 8. *Purpura maculosa,* Mart.: Gray, Dieff. N.Z., 233. *Cominella maculosa,* Mart.: Suter, T.N.Z.I., xxxviii, 329. *Buccinum testudineum,* Chemnitz, Conch. Cab., x, pl. 152, f. 1454 (not binomial). *Purpura testudinea,* Lam.: Gray, Yate N.Z., 308. *Buccinum testudineum,* Lam., Voy. Astrol., ii, 415, pl. 30, f. 8–11; Hutton, C.M.M., 15; Reeve, Conch. Icon., iii, pl. 9. f. 66. *Cominella testudinea,* v. Martens, Crit. List, 19; Kobelt, Jahrb. d. Deutsch. Mal. Ges., 1878, 233; Hutton, J. de Conch., 1878, 18; M.N.Z.M., 53; T.N.Z.I., xvi, 231; Tryon, Man. Conch. (1), iii, 203, pl. 80, f. 414, 415. *Purpura catarracta,* Chm.: Gray, Dieff. N.Z., 234.

Shell moderately large, elongated oval, solid, usually tessellated with yellowish and dark brown. *Sculpture:* The apparently smooth surface is finely microscopically spirally striate, and the flexuous growth-lines are also fine and inconspicuous; very rarely spiral liræ are present. *Colour* yellowish-white, light brown, or greenish-grey, tessellated with purplish-brown; sometimes with spiral bands of purplish spots, very rarely forming continuous lines; aperture bluish-grey within, inner lip brown, outer lip with a broad dark-brown band inside, margin orange interrupted by brown lines and spots; sometimes deep orange takes the place of purple. *Spire* conical, its height less than that of the aperture; outlines almost straight. *Protoconch* minute, smooth, nucleus convex. *Whorls* about 7, the last very high, flattened, depressed below the suture; base contracted above the fasciole. *Suture* not deep, sometimes narrowly margined below. *Aperture* subvertical, oval, narrowly and deeply channelled above, with an oblique short and widely open canal, its base very deeply notched. *Outer lip* convex, sinuated, sharp, thickened and lirate within. *Columella* vertical, but little excavated, angularly truncated below. *Inner lip* extending rather broadly over the pillar and the parietal wall, which bears a tubercle below the suture; below the lip is broadly reflexed over the umbilical area, narrowed to a triangular thick lamella, which forms the inner margin of the canal. *Fasciole* prominent, thick, carinated. *Operculum* horny, dark brown, oval, with the nucleus apical.

Diameter, 23 mm.; height, 42 mm.: angle of spire, 47–50°. Diameter, 26 mm.; height, 54 mm. (specimen, Lyttelton Harbour). Diameter, 24; height, 40 mm. (specimen, Auckland Harbour).

Dentition.—Hogg, Trans. Roy. Micr. Soc., 1868, pl. 10, f. 33; Hutton, T.N.Z.I., xv, 120, pl. 13, f. M, N.

Type lost.

Hab.—From the Bay of Islands to Banks Peninsula; Chatham Islands; Kermadec Islands. Brought to England by Captain Cook.

Remarks.—The shells are mostly much corroded. When the egg-depositing period arrives a score or more animals congregate under large stones, and the egg-capsules are deposited on the stone, and very often on the shells of other individuals, in clusters of thirty to forty.

They are oval, compressed, pointed at both ends, and fastened by a short stalk. The orange variety I collected at Island Bay, Cook Strait. The *Buccinum catarracta*, Chm., is considered by Tryon to be a mere colour variety of this species, and, as far as I know. Chemnitz gives New Zealand as the habitat; Krauss (Südafrik. Moll., 119), on the other hand, claims it for the coast of Natal, but I suspect that he wrongly identified his specimens.

Fossil in the Pliocene.

7. Cominella nassoides, Reeve, 1846. Plate 45, fig. 9.

Buccinum nassoides, Reeve, Conch. Icon., iii. pl. 3. f. 12. *Cominella nassoides*, Reeve: Kobelt, Jahrb. d. Deutsch. Mal. Ges., 1878, 234; Hutton, M.N.Z.M., 53; Tryon, Man. Conch. (1), iii, 206, pl. 81. f. 442; Hutton, T.N.Z.I., xvi. 232. *Buccinum* (*Cominella*) *zealandicum*, Reeve: Hutton, C.M.M., 14; not of Reeve. *Cominella nodicincta*, v. Martens, Sitzber. N.F. Berlin, 1878, 23; Tryon, Man. Conch. (1), iii, 206, pl. 81, f. 443. *Buccinum veneris*, Filhol, Compt. Rend., xci, 1880, 1094; Miss. I.C., 525.

Shell moderately large, fusiform, spirally lirate and axially costate, solid, yellowish-brown. *Sculpture* consisting of distant rounded cinguli, the much broader interspaces with numerous dense fine spiral threads; axial sculpture formed by rounded ribs, nodulous on crossing the cinguli, about 18 on the penultimate whorl; the costæ extend over all whorls, protoconch excepted, but are getting effaced on reaching the base; growth-lines flexuous, more or less distinct, sometimes decussating the fine spiral threads. *Colour* greyish or yellowish-brown, aperture yellowish-white within. *Spire* conic, very often turreted, its height equal to that of the aperture; outlines straight. *Protoconch* minute, globular, of 2 smooth whorls. *Whorls* 8, the last high, about two-thirds of the height of the shell, mostly shouldered, the shoulder grooved between the two cinguli, flatly convex below the shoulder; base slightly contracted. *Suture* well marked, undulating. *Aperture* oblique, oval, channelled above, with a short and widely open canal below, its base deeply notched. *Outer lip* somewhat expanded, sharp, thickened and distantly dentate within, a strongly raised tooth bounding the canal. *Columella* subvertical, smooth except a fasciolar ridge, strong, and broadly rounded. *Inner lip* broad, extending over the parietal wall, which bears a low plait below the suture, narrowed to a point below, which forms the inner margin of the canal. *Fasciole* distinct, carinated. *Operculum* horny, oval, dark brown, nucleus apical.

Diameter, 19 mm.; height, 36 mm.: angle of spire, 45–50°. Diameter, 25 mm.; height, 49 mm.

Animal unknown.

Type in the British Museum.

Hab.—Foveaux Strait and Stewart Island, 18 fathoms; Preservation Inlet; Chatham Islands; Auckland and Campbell Islands.

Remarks.—This subantarctic species is very variable. The Chatham Island specimens are generally large and more inflated, and Hutton separated them in 1873 as var. B. The *C. nodicincta*, v. Mts., is most likely this variety, but shells nearly approaching it occur also in Foveaux Strait.

Fossil.—Miocene and Pliocene.

8. Cominella Quoyi, Kiener, 1834. Plate 18, fig. 11.

Buccinum Quoyi, Kiener, Icon. Coq. Viv., Buccinum, 16, pl. 5, f. 13; Reeve, Conch. Icon., iii, pl. 13, f. 107. *Cominella Quoyi*, Kien.: Hutton, J. de Conch., 1878, 18; M.N.Z.M., 54; Tryon, Man. Conch. (1), iii, 204, pl. 80, f. 418.

Shell ovately oblong, with numerous revolving striæ and axial ribs on the spire-whorls. *Colour* reddish-brown, yellowish-brown within the aperture. *Spire* sharp, height somewhat less than that of the aperture. *Whorls* 7, the last high. *Aperture* oval, channelled above, with a short and open canal below. *Outer lip* arched, lirate inside. *Columella* almost straight.

Diameter, 17 mm.; height, 31·5 mm. (taken from the figure).

Type in the Mus. Hist. Nat., Paris.

Hab.—New Zealand.

Remarks.—It seems that only one specimen is in the Paris Museum, which was given to Kiener by Quoy and Gaimard. I have never seen a New Zealand shell which would correspond with the figure and short diagnosis of this species. It is evidently nearly allied to *C. virgata*, H. and A. Adams, but it is broader, and the revolving striæ are much more numerous; the spire is lower, with an angle of about 57°, against 45° in *C. virgata*. Until specimens are forthcoming, it seems safest to treat it as a distinct species.

9. Cominella virgata, H. and A. Adams, 1853. Plate 45, fig. 10.

Cominella virgata, H. & A. Ad., Ad. G.R.M., i, 110, 1853, pl. 11, f. 6; Hutton, J. de Conch., 1878, 18; T.N.Z.I., xvi, 232. *Buccinum lineolatum*, Q. & G., Voy. Astrol., ii, 419, pl. 30, f. 14–16. *Cominella lineolata*, Lam.: Hutton, M.N.Z.M., 53; not of Lamarck. *C. lineolata virgata*, H. and A. Adams, Man. Conch. (1), iii, 205, pl. 81, f. 425–29.

Shell rather small, fusiform, solid, with distant spiral brown lines, upper whorls costate. *Sculpture:* There are distant fine spiral liræ, generally 2 on the upper whorls, 3 on the penultimate, and 7 to 8 on the body-whorl; the interstices with fine spiral threads, but sometimes the shell is devoid of spiral ornamentation; the spire-whorls below the protoconch are axially costate, the costæ not extending over the body-whorl, about 12 on a whorl, broadly rounded and obsolete below the suture. *Colour* cinereous or light brown, the cinguli brown, not interrupted, sometimes the spirals or most of them are absent, the shell light grey, with longitudinal black or brown flammules and zigzag bands; columella bright orange. *Spire* elevated conic, usually

higher than the aperture; outlines nearly straight. *Protoconch* minute, of 2 smooth whorls. *Whorls* 8, first slowly increasing, the last high, depressed, and lightly concave below the suture, thence flatly rounded; base contracted. *Suture* not deep, undulating. *Aperture* subvertical, oval, channelled above, with a short, oblique, widely open, and deeply notched canal at the base. *Outer lip* contracted above, lightly sinuate, convex below, sharp, somewhat thickened and lirate within, the interspaces dark brown. *Columella* vertical, but little excavated. *Inner lip* moderately broad, spreading over the parietal wall, which has a roundish callosity below the suture, narrowing rapidly below, twisted, and forming as a solid lamella the inner margin of the canal. *Fasciole* prominent, keeled. *Operculum* horny, dark brown, oval, nucleus apical.

Diameter, 17 mm.; height, 34 mm. (from fig. in Voy. Astrol). Diameter, 18 mm.; height, 36 mm. (large specimen, Auckland).

Dentition.—Hutton, T.N.Z.I., xv, 120, pl. 13, f. K.

Type in the Mus. Hist. Nat., Paris (*B. lineolatum*, Q. & G.).

Hab.—From the Bay of Islands to East Cape, common; Kermadec Islands.

Fossil in the Pliocene.

10. Cominella zealandica, Reeve, 1846. Plate 45, fig. 11.

Buccinum zealandicum, Reeve, Conch. Icon., iii, pl. 4, f. 28. *Cominella zealandica*, Reeve, Man. Conch. (1), iii, 183, pl. 79, f. 384; Suter, T.N.Z.I., xxxviii, 330.

Shell rather small, elongated oval, solid, spirally lirate and axially costate, with revolving lines of brown spots. *Sculpture* consisting of close, narrow, and rounded cinguli, alternately narrow and broader, crossed by axial, distinct, broadly rounded ribs, cut up into nodules at the points of intersection with the spirals, 12 to 14 on the penultimate whorl; they are, with the exception of the protoconch, present on all whorls, but obsolete on the base; growth-lines inconspicuous. *Colour* yellowish-white, with irregularly distributed brown spots on the larger cinguli; aperture light brown or whitish within. *Spire* conical, somewhat turreted, its height about the same as that of the aperture; outlines slightly convex. *Protoconch* small, smooth. *Whorls* 6, first slowly increasing, the last very high, quite two-thirds of the total height, lightly shouldered, moderately convex below the angle; base slightly contracted. *Suture* impressed, undulating. *Aperture* subvertical, oval, channelled above, with a short, open, and deeply notched canal below. *Outer lip* slightly expanded, convex, sharp, thickened and dentate within. *Columella* vertical, straight, smooth. *Inner lip* moderately broad, extending over the parietal wall, which has a rounded callosity below the suture; narrowed below and produced as a twisted lamella to form the inner margin of the canal. *Operculum* unknown.

Diameter, 20 mm. ; height, 32 mm. (from Reeve's figure). Diameter, 14 mm. ; height, 27 mm. (New Zealand, in my collection). Diameter, 13 mm. ; height, 23 mm. (East Cape).

Animal unknown.

Type in the British Museum.

Hab.—East Cape.

Remark.—This is a rare species, and appears to be also variable in form. It seems to live in the laminarian zone.

Fossil in the Pliocene of Waikopiro.

Subfam. 2. PHOTINÆ.

Siphonal fasciole with an outer groove ; aperture without a posterior channel ; canal short and wide ; columella with an anterior slight fold.

Genus 2. PHOS, Montfort, 1810.

Phos, Montfort, Conch. Syst., ii, 1810, 494. Type : *Murex senticosus*, L. *Rhinodomus*, Swainson, 1840.

Animal with a small head, with the tentacles approximating or connate at their base, and eyes near their tips ; foot broad, with 2 lateral projections anteriorly, and a slender posterior filament ; male organ long, thin, and flat. Radula with the central tooth tricuspidate, the laterals with 2 cusps, the outer cusps a little longer.

Shell elongated oval, acuminated, turriculate, generally with axial ribs and spiral liræ ; spire long ; apex acute ; aperture elongated oval ; outer lip generally lirate within, slightly sinuate below ; columella arcuate, plicated at the base ; canal very short, slightly curved outward. Operculum unguiform, triangular, lightly curved, nucleus apical.

Distribution. — Japan, China, Philippines, Indian Ocean, Australasia.

Fossil in the Tertiary.

1. **Phos tenuicostatus**, T.-Woods, 1877. Plate 41, fig. 5.

Cominella tenuicostata, T.-Woods, P.R.S. Tas., 1876 (1877), 135. *Phos tenuicostatus*, T.-Woods : Tate and May, P.L.S. N.S.W., xxvi, 358, fig. in text.

Shell small, turriculate, axially costate and spirally striate, light brown. *Sculpture* of the post-nuclear whorls consisting of prominent, somewhat distant, broadly rounded axial ribs, about 18 on the body-whorl ; they are thin and sharp on the shoulder of the whorls, somewhat flexuous on the base ; crossed by numerous unequal spiral threads. *Colour* light brown. *Spire* acuminate, turriculate, a little higher than the aperture with canal. *Protoconch* stout, subcylindrical, smooth, of 2 whorls. *Whorls* 6 to $6\frac{1}{2}$, regularly increasing, the last rather large and somewhat ventricose, narrowly shouldered ; base contracted. *Suture* linear, not deep. *Aperture* slightly oblique, ovate, angled above, with a short broad canal below, which is turned to the

left and its base moderately notched. *Outer lip* sinuate above and below, convex at the middle, strengthened by an outer axial rib. *Columella* short, straight, bent to the left below, excavated above toward the lightly convex parietal wall; at the base the columella is slightly twisted and forms an inconspicuous fold. *Inner lip* smooth, narrow, with a slight vertical outer groove towards the siphonal fasciole, which is lamellate, convex, with an outer groove and a narrow ridge, being the continuation of the basal margin. *Operculum* not seen.

Diameter, 9 mm.; height, 17 mm.

Animal unknown.

Type in the Tasmanian Museum, Hobart.

Hab.—Milford Sound, 100–120 fathoms (Professor Chilton). The type is from Eagle Hawk Neck, Tasmania.

Remark.—Two specimens, one immature, were dredged by the scientific party visiting the Sounds in December, 1908. It adds a genus and a species to our fauna.

Subfam. 3. PISANIINÆ.

Notch on the base of the canal moderate, fasciole not carinated.

Genus 3. PISANIA, Bivona, 1832.

Pisania, Bivona, Effem. scient., 1832, 55. Type: *Murex pusio*, L. *Pusio*, Gray, 1833. *Proboscidea*, Schmidt, 1832 (*teste* Herrmansen). *Evarne*, Adams, 1858 (*teste* Zittel). *Algrus*, de Gregorio, 1885.

Animal having the foot subtruncated in front and the sides angular; tentacles with the eyes near their bases; male organ long and narrow. Central tooth of radula with 3 to 5 denticles, lateral teeth tricuspidate, the median cusp small.

Shell elongated oval, solid, of moderate size; spire conical, elevated; whorls but little convex, suture not deep, the last whorl high, basal fasciole obsolete; aperture high, oval, narrowly channelled above, with a short open canal below, its base slightly notched; columella concave at the middle; outer lip varicose, finely denticulate inside. Operculum horny, unguiform, somewhat arched, nucleus apical.

Distribution.—Mediterranean, Antilles, Indian and Pacific Oceans, Australasia.

Fossil in the Tertiary.

1. Pisania reticulata, A. Adams, 1855. Plate 45, fig. 12.

Pisania reticulata, A. Ad., P.Z.S., 1854 (1855), 138; Man. Conch. (1), iii, 147, pl. 71, f. 201; Index, 73.

Shell elongately oval, solid, yellowish-brown, finely reticulate, outer lip with a prominent varix in the adult. *Sculpture* consisting of numerous fine spiral liræ, reticulated by axial fine flexuous riblets; there is usually a varix on the penultimate whorl, and one on the body-whorl opposite the outer lip, besides the varix on the latter.

Colour light yellowish-brown, sometimes marbled with reddish-brown; varices with a few brown bands; aperture light brown inside; outer lip white within. *Spire* high, conic, a little higher than the aperture; outlines slightly convex. *Protoconch* small, of 1 smooth whorl, convex. *Whorls* 6, regularly increasing, but the last high, lightly convex; base somewhat contracted. *Suture* uneven, impressed. *Aperture* high, oval, distinctly narrowly channelled above, with a short, open, faintly recurved canal below, its base slightly notched. *Outer lip* straightened above, convex further down, with a thick broadly rounded varix on the outside, much thickened and denticulate within. *Columella* vertical, moderately excavated, smooth, and rounded. *Inner lip* not broad, distinctly limited, spreading over the slightly convex parietal wall, which bears a moderate broad tubercle below the suture. *Operculum* horny, with apical nucleus.

Diameter, 12 mm.; height, 31 mm. Diameter, 10 mm.; height, 24 mm. (New Zealand specimen).

Animal unknown.

Type in the British Museum.

Hab.—Rangitoto Island (C. Spencer); Cape Maria van Diemen. Also New Caledonia, Australia, and Tasmania.

Remark.—The spiral and axial ornamentation may be of equal strength, or the latter predominant. The species is very rare with us.

Genus 4. Cantharus, Bolten, 1798.

Cantharus, Bolten, Mus. Bolten. (2), 1798, 132. Type: *C. Tranquebaricus*, Gmel. *Pollia*, Gray, 1839 (in part).

Animal having a narrowly elongated posteriorly obtuse foot, the eyes at the bases of the tentacles, and a long siphon. Central tooth of the radula narrow, with 5 cusps; lateral teeth tricuspid, the median cusp shorter than the others, the inner border of the inner cusp sometimes crenated.

Shell buccciniform, generally cancellated, having a thick epidermis; spire pointed; aperture elliptical, channelled above; outer lip thickened and varicose, lirate within; columella concave; parietal wall with a tooth above. Operculum horny, unguiculate, nucleus apical.

Distribution.—Antilles, Senegal, Japan, China, Pacific, Australasia, Indian Ocean.

Fossil in the Tertiary.

Subgen. 1. Cantharus, s. str.

Shell spirally lirate and strongly axially costate, the latter sculpture predominating; whorls mostly more or less distinctly shouldered; outer lip with a distinct varix, formed by the last axial rib; columella transversely ridged, the ridges extending usually the whole length of it; an umbilical chink is mostly present.

1. **Cantharus fuscozonatus,** Suter, 1908. Plate 18, fig. 12.

Tritonidea (*Cantharus*) *fuscozonata,* Suter, T.N.Z.I., xl, 1907 (1908), 370, pl. 30, f. 5.

Shell ovato-fusiform, spirally ridged and axially broadly costate. *Sculpture* consisting of regular spiral liræ of subequal strength, the interstices with 1 or several fine spiral threads; the liræ more prominent and further apart on the base; axial ornamentation formed by rather distant, elevated, and broadly rounded axial costæ, about 15 on a whorl, the spirals passing over them; they are getting obsolete on the base. *Colour* fulvous, the spiral riblets purple, sometimes a purple band above the suture and a second below the periphery of the body-whorl are present, also longitudinal streaks of light brown; aperture whitish within. *Spire* conical, turreted, of the same height as the aperture with canal; outlines straight. *Protoconch* conical, axially striate. *Whorls* 6 to 7, the last high, concave at the shoulder, convex below it; base contracted. *Suture* not deep, undulating. *Aperture* somewhat oblique, narrowly channelled above, with an oblique, narrowly open, and slightly recurved canal below, its base notched. *Outer lip* thick, with a distinct varix outside, callous and denticulate within. *Columella* vertical, concave, with transverse ridges over the whole length. *Inner lip* narrow, spreading over the concave parietal wall, which bears a tubercle above; narrowed below to a point. Some specimens have a distinct depression between the fasciole and the edge of the canal. *Operculum* unknown.

Diameter, 14 mm.; height, 26 mm. (type).

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—East Cape Lighthouse (type); Foveaux Strait.

Remark.—This species is very variable in size, my largest specimen, of 7 whorls, measuring 17 mm. by 32 mm.; the smallest, also of 7 whorls, 10·5 mm. by 21 mm.: but numerous intermediate forms occur.

Subgen. 2. TRITONIDEA, Swainson, 1840.

Tritonidea, Swains, "Malacology," 74, 302. Type: *Buccinum undosum,* L.

Shell spirally regularly lirate, with more or less distinct axial costæ, the spiral sculpture, however, being the predominant feature; whorls mostly convex; outer lip subvaricose, lirate within; columella with a few transverse ridges below.

2. **Cantharus Colensoi,** Suter, 1908. Plate 18, fig. 13.

Tritonidea Colensoi, Suter, T.N.Z.I., xl, 1907 (1908), 371, pl. 30, f. 6.

Shell small, ovate, solid, distinctly broadly spirally lirate, and more or less distinctly axially costate on the spire-whorls. *Sculpture* consisting of broad and flattish spiral liræ, 3 on the penultimate, 9 to

10 on the body whorl, the interstices narrow, linear; they are crossed on the spire-whorls by flatly rounded axial ribs, about 12 on a whorl, which usually cut up the spirals into squarish nodules. *Colour* white, the spiral grooves purplish-brown; a few longitudinal, narrow, light-brown bands passing over the body-whorl and across the interstices of the axial ribs; aperture purple within; outer lip and columella white. *Spire* short, conic, about the same height as the aperture; outlines faintly convex. *Protoconch* very small, convex, of $1\frac{1}{2}$ smooth whorls. *Whorls* 5, the last high, flattish; base slightly contracted. *Suture* not deep, uneven. *Aperture* somewhat oblique, narrowly channelled above, produced below into a short, oblique, and narrowly open canal, its base notched. *Outer* lip very thick, with a blunt edge and a broad varix on the outside, inside callous, denticulate-lirate. *Columella* vertical, lightly concave, with several ridges at its base. *Inner lip* narrow, not distinctly bounded, extending over the concave parietal wall, which has one or two tubercular plaits above; at the base the lip is narrowed towards the canal. *Operculum* unknown.

Diameter, 10 mm.; height, 18 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—East Cape Lighthouse.

Remarks.—This shell was first shown to me by Mr. H. Hill, jun., of Napier, who told me that the examples in his possession were collected by the late Rev. W. Colenso, the exact locality being unknown. It may well be that the species ranges from the East Cape down to Hawke's Bay.

Fam. **ALECTRIONIDÆ**, Dall.

Nassidæ, Swainson.

Animal having a broad foot, with 2 slender posterior appendages; siphon long; eyes on the outer sides of the tentacles. Radula triserial; central tooth arched, pectinated; lateral teeth usually bicuspidate, but sometimes with intermediate serrations, on the inner side with an accessory plate.

Shell ovate, spire usually elongated, aperture with a notch at the base, without a canal; columella usually twisted by a basal fold, but sometimes there is no twist at all, or the columella is simply truncated. Operculum small, corneous, ovate, with an apical nucleus and the margins plain or serrated.

Genus 1. Alectrion, Montfort, 1810.

Alectrion, Montfort, Conch. Syst., ii, 1810, 565. Type: *Buccinum papillosum*, L. *Nassa*, Lamarck, 1799; not of Bolten, 1798. *Nassacites*, Krüger. *Nassina*, Gray, 1847 (in part). *Nassoburna*, de Greg., 1890.

Animal having an elongated foot, truncated in front; tentacles moderately long; siphon thin and long. Lateral teeth of radula generally bicuspidate. accessory plates visible.

Shell ovate, ventricose, body-whorl variously sculptured; aperture ovate, contracted below, but without a canal, and deeply notched, with a high fasciole; outer lip crenulated internally; columella smooth, carinated, and twisted by an obliquely transversal plait; inner lip often widely spread over with enamel, with a callosity or blunt dentiform plait on the parietal wall. Margin of operculum entire or serrated.

Distribution.—World-wide, principally in the waters of tropical and subtropical latitudes.

Fossil in the Tertiary; the maximum in the Miocene.

KEY TO SPECIES.

a. Body-whorl with 5–6 spiral rows of tubercles	*dissimilis.*
b. Body-whorl with 5–6 spiral rows of sharp prickles ..	*ephamilla.*
c. Body-whorl with 9 spiral ribs, crossed by about 20 axial ribs, crossing-points granular	*fasciata.*
d. Whorls with a narrow shoulder coronated with a row of tubercles of the axial ribs	*suturalis Dunkeri.*

1. Alectrion dissimilis, Watson, 1886. Plate 19, fig. 1.

Nassa dissimilis, Wats., Chall. Rep., xv, 1886, 175, pl. 17, f. 6.

Shell thin, very stumpy, with a short broad body-whorl, short rounded base, short conical subscalar spire; a very short, gibbously rounded aperture, and an excessively short columella. *Sculpture:* There are frequent feeble riblets at irregular distances, which are dotted with small round tubercles; the shallow parting furrows are broadish, and are scored with strongish lines of growth. Spirals—the tubercles on the riblets, though unconnected, are yet arranged in rows, of which there are 5 or 6 on the body-whorl; below these, on the base, are 5 feeble distant threads. *Colour* white. *Spire* low and stumpy, subscalar, height about that of the aperture. There are $4\frac{3}{4}$ *whorls* remaining (apex broken); they are short, broad, and convex, the last a little tumid, with a short rounded base. *Aperture* direct, small, round, not channelled above, deeply notched at the base. *Outer lip* regularly curved. *Columella* very short. *Inner lip* flat across the body, advancing very little. *Fasciole* distinct, the upper edge with a sharp thread, above which lies a furrow. *Operculum* unknown. (Watson.)

Diameter, 9·25 mm.; height, 14 mm.

Animal unknown.

Type in the British Museum.

Hab.—Chall. Stat. 168, east of Blackhead, in 1,100 fathoms.

2. Alectrion ephamilla, Watson, 1882. Plate 19, fig. 2.

Nassa (*Tritia*) *ephamilla*, Wats., J.L.S., xvi, 1882, 370; Chall. Rep., xv, 187, pl. 11, f. 9; Hutton, T.N.Z.I., xvi, 233; Index, 72.

Shell rather small, thin, chalky porcellanous, ovate, with a shortish scalar spire, a rounded apex, a marginated suture, whorls rounded

and beset with small prickles, a tumid base, and a very short pillar. *Sculpture:* There are on each whorl about 20 feeble narrow axial ribs, which do not extend to the suture above, and die out on the base; lines of growth fine, flexuous, and close-set; on the penultimate whorl there are 4 broad, slightly raised, spiral threads, the points of crossing with the axials rise into small tubercles; on the body-whorl their number is 5 or 6, and 4 to 5 more are on the base. *Colour* chalky-white. *Spire* rather short, more or less scalar, of the same height as the aperture; outlines convex. *Protoconch* blunt and rounded, of nearly 4 smooth convex whorls, the nucleus immersed. *Whorls* 7, shortly shouldered, lightly convex; base rounded, concave below. *Suture* impressed, flatly marginated below. *Aperture* oval, not channelled above, deeply notched below. *Outer lip* thin, sharp, and patulous. *Columella* short and concave. *Inner lip* thick, narrow, extending over the parietal wall, which has no plait above, sharply pointed and expanded below. *Operculum* plain-edged, small, triangular, slightly subspiral, apex terminal. (Watson.)

Diameter, 8·25 mm.; height, 14·75 mm. (type).

Animal unknown.

Type in the British Museum.

Hab.—Chall. Stat. 169, east of East Cape, in 700 fathoms.

3. **Alectrion fasciata,** Lamarck, 1822. Plate 45, fig. 16.

Buccinum fasciatum, Lam., A.s.V., vii, 1822, 271; Voy. Astrol., ii, 445, pl. 32, f. 18–21. *Nassa fasciata*, Lam., Conch. Icon., viii, pl. 4, f. 10. *N.* (*Hima*) *fasciata*, Lam., Man. Conch. (1), iv, 46, pl. 14, f. 237, 238.

Shell ovate, acuminate, somewhat ventricose, solid, cancellated and granulated, body-whorl with 2 brown spiral bands. *Sculpture* consisting of numerous equal vertical riblets, about 20 on the last whorl, extending over the base to the siphonal fasciole, the interstices wider than the ribs; they are crossed by unequal and inequidistant spiral ribs, the points of intersection raised into roundish granules; there are 4 rows of cinguli on the penultimate whorl, the lowest of which is narrower and close to the suture; body-whorl with 7 to 9 cinguli; a few fine spiral striæ are crossing the growth-lines. *Colour* whitish, with a narrow or broad brown spiral band on the suture of the spire-whorls, continued over the periphery of the body-whorl; a second brown band on the base. *Spire* conic, somewhat scalar, higher than the aperture. *Protoconch* obtuse, smooth, of 2 whorls. *Whorls* 8, flattish, the last ventricose, convex, slightly ascending in front of the aperture; base channelled above the broad and elevated fasciole, which bears about 5 spiral smooth ribs. *Suture* distinct, undulating. *Aperture* slightly oblique, ovate, channelled above, with a short, reflected, and deeply notched canal below. *Outer lip* convex, with a very prominent marginal varix, with 5 teeth on its lower inner part. *Columella* subvertical, concave, obliquely truncated below. *Inner lip* thick, spreading beyond the pillar, with a few tubercles; on

the flattish parietal wall the callosity is thinner, but rather broadly spreading, and there is a sharp plait below the suture. *Operculum* oval, the columellar margin serrate.

Diameter, 10 mm. ; height, 18 mm.

Type in the Mus. Hist. Nat., Geneva.

Hab.—Bay of Islands (J. C. Anderson). Also Australia and Tasmania.

4. Alectrion suturalis, Lamarck, subsp. **Dunkeri,** Suter, 1908. Plate 45, fig. 17.

Nassa intermedia, Dunker, Verh. Zool. Bot. Ges. Wien, xvi, 1866, 909 ; Frauenfeld, "Novara" Zool., ii, Moll., 5, pl. 1, f. 2 ; not of Forbes. *Buccinum suturale*, Lam., A.s.V., vii, 1822, 269. *Nassa glans*, L., var. *suturalis*, Lam. : Watson, Chall. Rep., xv, 179. *N. glans*, L., Index, 72. *N. suturalis Dunkeri*, Suter, T.N.Z.I., xl, 1907 (1908), 350.

Shell ovato-conic, thin and fragile, upper whorls axially costate. *Sculpture* consisting of a few unequal spiral riblets on most of the spire-whorls, except the protoconch, and also on the base ; axial straight rounded riblets are present on the whorls below the protoconch ; they may be confined to a few of the upper whorls, or extend even over the body-whorl, coronating the narrow shoulder with a row of tubercles. *Colour* whitish, variegated and flamed with fulvous ; usually 3 distant fine brown spiral lines on the spire-whorls, 5 to 7 on the body-whorl. *Spire* conic, somewhat higher than the aperture ; outlines lightly convex. *Protoconch* small, conical, of 2 smooth blackish whorls. *Whorls* 7, first slowly increasing, the last two-thirds of the height of the shell, flatly convex and very narrowly shouldered ; base flattish, grooved close to the fasciole. *Suture* very lightly impressed. *Aperture* oval, very distinctly canaliculate above, broadly and deeply notched below. *Outer lip* convex, thin and sharp, usually with a triangular inflection above, and sometimes with 4 to 5 minute teeth near the base. *Columella* vertical, concave, with a distinct basal fold. *Inner lip* broad, its margin more or less free, spreading over the parietal wall, with a callosity and plait above, the former extending some distance beyond the mouth. *Fasciole* prominent, obliquely finely ribbed. *Operculum* not seen.

Diameter, 17 mm. ; height, 29 mm. (type, from Port Jackson). Diameter, 12 mm. ; height, 24 mm. (specimen from Cuvier Island).

Animal unknown.

Type in the K.K. Hofmuseum, Vienna.

Hab.—Kermadec Islands (Miss Robison) ; four miles west of Cuvier Island, in 44 fathoms (Captain Bollons). Also Australia.

Fam. **MURICIDÆ**, Fleming.

Animal having a moderately long foot, truncated anteriorly ; tentacles elongated, bearing the eyes on their sides, more or less high up. Verge long, narrow, and club-shaped. Radula with the central

tooth transverse and few cusps ; lateral teeth unicuspidate ; formula, as a rule, $1+\frac{1}{5}+1$.

Shell with a moderately long spire, fusiform, canal more or less elongated, often closed by the approachment of the opposite margins : ornamented with ribs, often spinose or foliated. Operculum ovate, with subapical or apical nucleus.

The molluscs composing this family are carnivorous, living on Gastropods and Lamellibranchs, whose shell they pierce with the radula, forming a round hole, through which they insert their long proboscis.

Fossil.—The *Muricidæ* first appear in the Cretaceous.

Key to Genera.

A. Shell with spiny or foliaceous varices ; canal almost closed ; operculum with the nucleus subapical .. .. .. Murex.
B. Shell usually with numerous foliated varices or simple ribs, sometimes the spiral liræ predominating ; canal open ; operculum with the nucleus sublateral .. .. Trophon.
C. Shell with tubular spines and projecting hollow tubes between the varices ; canal closed ; operculum with the nucleus apical .. Typhis.

Genus 1. Murex, Linnæus, 1758.

Murex, L., Syst. Nat., ed. x, 1758, 746. Type : *M. brandaris*, L. *Bolinus*, Pusch, 1837. *Rhinacantha*, H. and A. Adams, 1853.

Animal with a large broad foot ; tentacles long and tapering, the eyes situated on the outside, near the end ; proboscis cylindrical, long ; verge long, club-shaped, situated on the right side behind the tentacle. Dentition $1+\frac{1}{5}+1$; the lateral cusps of the central tooth very large, the next two very small, and the central cusp very large : lateral teeth with single cusps, long and prong-like.

Shell ovate or oblong ; spire always prominent ; whorls rounded, crossed by 3 or more spinose or foliated varices ; canal long or short, always distinct, partly open. Operculum ovate, with subapical nucleus.

Over 300 species are known, inhabiting tropical and temperate seas.

The purple of the ancients was obtained from *M. brandaris* and *M. trunculus*. The pigment is contained in cells of the mantle, is colourless or yellowish, but under the influence of light it turns yellow, green, blue, and then purple. The dye can be fixed upon fibres without the help of a mordant, and the colour is brilliant and solid.

Key to Subgenera.

A. Shell with more than 3 varices, foliated or tubulated ; canal curved and short .. .. Muricantha.
B. Shell with 3 fin-like or foliated varices ; canal short and varicose .. .. Pteropurpura.

Subgen. 1. MURICANTHA, Swainson, 1840 (em.).

Muricanthus, Swains., Treat. Malacology, 1840, 296. Type: *Murex radix*, Gmelin. *Centronotus* Swains., 1835; not of Schneider, 1801. *Phyllonotus*, Swains., 1840. *Bassia*, Jouss., 1879; not of Quoy and Gaimard, 1834.

Shell broadly ovate, with from 4 to 15 scaly or foliated varices; whorls rounded, spiral sculpture well developed; spire ranging from depressed to considerably elevated; canal of moderate length, curved, nearly closed; aperture ovate; outer lip crenulated.

Sect. 1. MURICANTHA, s. str.

1. Murex octogonus, Quoy and Gaimard, 1833. Plate 48, fig. 1.

Murex octogonus, Q. & G., Voy. Astrol., ii, 1833, 531, pl. 36, f. 8, 9. Gray, in Dieff. N.Z., 229; Hutton, M.N.Z.M., 47; T.N.Z.I., xvi, 218; Tryon, Man. Conch., ii, 110, pl. 30, f. 272–73; Conch. Icon., iii, pl. 29, f. 134.

Shell ovato-fusiform, narrowly perforated, solid, with spiny varices, brown. *Sculpture:* The first four whorls below the protoconch axially costate, the number of costæ varying from 8 to 10; further down they are forming strong varices, each carrying hollow spines, which are recurved and open on the anterior side; those on the carina of the whorls are usually much longer than the others; their number is 4 on the antepenultimate, 7 to 8 on the penultimate, and 11 to 13 on the body-whorl; they extend over the base to the middle of the canal; around the umbilical fissure there is a half-circle of former canals, each of them being the continuation of a varix, and their number varies from 4 to 5. The spiral sculpture consists of narrow rounded ribs of subequal strength, narrow or subobsolete upon the shoulder of the whorls, sometimes with a fine thread in the interstices; they are usually scabrous between the varices, on which they are produced into spines. *Colour* varying from cinereous to dark brown, the spiral liræ mostly of darker colour; interior of the aperture white, often tinted with purple or light brown. *Epidermis* thin, persistent, not shining. *Spire* conical, gradate, with a sharp apex, about $1\frac{1}{2}$ times the height of the aperture without the canal. *Protoconch* very small, of $1\frac{1}{2}$ smooth whorls, convex, the nucleus lateral. *Whorls* 9 to 10, first slowly then more rapidly increasing, distinctly shouldered, flattish on the shoulder, lightly convex below it; base contracted. *Suture* not much impressed, wavy. *Aperture* ovate, rounded above, produced below into a moderately long recurved canal, which is only very narrowly open, and rounded at its base. *Outer lip* angled above, thin and sharp, deeply grooved. *Columella* short, subvertical, lightly excavated and obliquely truncated below. *Inner lip* forming a fairly thick callous layer over the columella and upon the concave parietal wall, usually extending a little beyond the pillar, often terminating in a free sharp edge. *Umbilical fissure* narrow, but distinct. *Operculum* solid, horny, light brown, with a subapical nucleus.

Diameter, 16 mm. ; height, 37 mm. (type). Diameter, 29 mm. ; height, 55 mm. (large specimen, Hauraki Gulf).

Animal with thick, short, and flattened tentacles, with the eyes near their extremities ; foot oval, its sides, head, and tentacles yellowish with red striæ ; the locomotive disc whitish.

Dentition.—Hutton, T.N.Z.I., xv, 118, pl. 13, f. C.

Type in the Mus. Hist. Nat., Paris.

Hab.—North Island, from the Bay of Islands (locality of the type) to Cook Strait, from low-water mark to about 25 fathoms, not common ; Kermadec Islands. Also South Australia.

Remarks.—*Murex dipsacus*, Brod. ; *M. peruvianus*, Sow. ; *M. cuspidatus*, Sow., which have been mentioned as being synonymous with our species, are no doubt distinct.

Fossil in the Pliocene.

Var. **umbilicatus**, T.-Woods, 1876.

Trophon umbilicatus, T.-Woods, P.R.S. Tas., 1875 (1876), 135. *Murex scalaris*, A. Adams, P.Z.S., 1853, 71 ; not of Brocchi. *Urosalpinx umbilicata*, Wood, Man. Conch. (1), ii, 155. *Murex Angasi*, Tryon, *t.c.*, 109 ; not of Crosse. *M. umbilicatus*, T.-Woods : Verco, T.R.S. S.Aust., 1895, 96 ; 1896, 231, pl. 7, f. 4 : Pritchard and Gatliff, P.R.S. Vic. (n.s.), x, 254. *M. octogonus*, var. *umbilicatus*, T.-Woods : Suter, J. Mal., viii, 61 ; Index, 71.

Distinguished from the species by a more or less open umbilicus, which causes the spines round the base to spread much further out ; otherwise there is no difference.

Type in the Tasmanian Museum, Hobart.

Hab.—Hauraki Gulf, in about 20 fathoms. Also Tasmania and the southern coasts of Australia.

Fossil in the Pliocene.

Var. **espinosus**, Hutton, 1886.

Murex espinosus, Hutt., T.N.Z.I., xviii, 1885 (1886), 333 ; Plioc. M., 38, pl. 6, f. 3 ; Index, 71.

In this variety the spines on the varices are absent ; the shell is simply axially broadly costate, 8 to 9 ribs on a whorl.

Type, from the Pliocene, in the Canterbury Museum, Christchurch.

Hab.—Hauraki Gulf ; East Cape ; Mokohinau Islands.

Fossil in the Pliocene.

Sect. 2. Poirieria, Jousseaume, 1879.

Poirieria, Jouss., "Revue de Zoologie," 1879. Type : *Murex zelandicus*, Q. & G. *Paziella*, Jousseaume, 1879.

Shell fusiform-ventricose ; spire conic, gradate ; protoconch with a small and deviated nucleus ; whorls angled at the middle, with 6 to 8 varices, and ornamented with tubular spines ; last whorl ample, excavated above the moderately long open canal ; aperture pyriform ; columella vertical ; umbilical chink distinct.

2. Murex zelandicus, Quoy and Gaimard, 1833. Plate 48. fig. 2.

Murex zelandicus, Q. & G., Voy. Astrol., ii, 1833, 529. pl. 36, f. 5–7; Gray, in Dieff. N.Z., 229; Conch. Icon., iii, pl. 34. f. 177; Hutton, M.N.Z.M., 46; T.N.Z.I., xvi, 218; Tryon, Man. Conch. (1), ii, 108, pl. 29, f. 268; Watson, Chall. Rep., xv, 157.

Shell pyriform, rather thin, narrowly perforated, with long spines, yellowish-white. *Sculpture:* There are usually 6 varices, with long tubular spines, 1 on the spire-whorls and 5 to 7 on the body-whorl; they are open in front and more or less curved upwards; on the last whorl the spines upon the angle are longest, next in length is the fifth, then the third and seventh, and the second, fourth, and sixth are the shortest. If only 5 spines are present, the spines decrease in the following order: fourth, fifth, third, and second. Spiral sculpture is present only on the body-whorl, the shoulder being smooth, but upon and below the angle fine spiral threads encircle the whorl from one spine to the next. Outside the umbilical fissure is a prominent fasciole formed by former canals, one laying above the other. *Colour* varying from yellowish-white to light brown. *Spire* conical, gradate, the angle of the spire-whorls median, height about the same as that of the aperture without the canal. *Protoconch* very small, of $1\frac{1}{2}$ smooth convex whorls, the nucleus a little deviated. *Whorls* angulated, 6, the last large and ventricose; base flattish, contracted above the canal. *Suture* well marked, not deep. *Aperture* pyriform, rounded above, produced below into a moderately long and open canal, somewhat recurved and bent to the right. *Outer lip* angled above, ornamented with the hollow spines of the last varix, grooved. *Columella* vertical, but very slightly concave. *Inner lip* fairly thick, spreading a short distance beyond the pillar and above over the lightly excavated parietal wall; at the base it is much narrowed, and continuing forms the sharp left margin of the canal. The *umbilical chink* is narrow, but quite distinct. *Operculum* horny, unguiculate, yellowish-brown, the nucleus subapical.

Diameter, 20·3 mm.; height, 54 mm. (type).

Animal having the foot large, cylindrical, and bell-shaped; tentacles short, thick, obtuse, with the eyes near their points. Colour yellowish-white, the tentacles reticulated with white.

Type in the Mus. Hist. Nat., Paris.

Hab.—North and South Islands, in depths ranging from a few to 600 fathoms; the type is from a depth of a few fathoms in Cook Strait; Opotiki; Kawau Island (H. S.); off Great Barrier Island, in 110 fathoms; near Channel Island, Hauraki Gulf, in 25 fathoms; Queen Charlotte Sound, in 10 fathoms (Chall. Exp.); forty-five miles north of the Kermadec Islands, in 600 fathoms (Chall. Exp.); Stewart Island (Captain Bollons).

Also inside the reef off Nukualofa, Tongatabu, in 18 fathoms (Chall. Exp.).

Fossil in the Miocene and Pliocene.

Subgen. 2. Pteropurpura, Jousseaume, 1879.

Pteropurpura, Jouss., "Revue de Zoologie," 1879. Type: *Murex macropterus*, Desh. *Pteronotus*, Swains., 1840; not of Gray, 1838, nor Swains., 1839. *Triplex*, Humphrey, 1797, in Newton, 1891; not of Perry, 1811. *Purpurellus*, Jouss., 1879; not *Purpurella*, Desv., 1853. *Triremis*, Bayle, 1884. *Pterymurex*, Rovereto, 1899.

Shell triangular, with 3 varices, which are fin-like or foliated; whorls rounded; spire elevated; canal moderately straight or somewhat curved, nearly closed; aperture oblong-ovate, the outer lip generally simple, but sometimes crenulated.

Sect. 1. Alipurpura, Bayle, 1884.

Alipurpura, Bayle, in Fischer's Manuel, 641. Type: *Murex acanthopterus*, Lam.

Shell fusoid, elongated; protoconch paucispiral, with a rather large and papillate nucleus; varices discontinuous and spinous above; canal moderately long, almost straight and open.

3. Murex Angasi, Crosse, 1863. Plate 46, fig. 14.

Typhis Angasi, Crosse, J. de Conch., xi, 1863, 86, pl. 1, f. 2; *Murex Angasi*, Crosse: Angas, P.Z.S., 1867, 186; Sowerby, Thes. Conch., iv, Murex, 1879, 26, pl. 21, f. 189, 190; Hutton, M.N.Z.M., 47; Tryon, Man. Conch. (1), ii, 88, pl. 40, f. 522; Kesteven, P.L.S. N.S.W., xxvi, 711, pl. 36, f. 6, 7 (protoconch). *M.* (*Pteronotus*) *Cordismei*, Watson, J.L.S., xvi, 1883, 601; Chall. Rep., xv, 156, pl. 10, f. 5.

Shell small, fusiform, scalar, thin, with 3 foliated and spinous varices, pale. *Sculpture* consisting of 3 foliated, slightly discontinuous varices, which at the angle of shoulder rise into a semitubular, upturned, and slightly reverted spine; between each two varices and almost at a level with the spines are 3 large rounded tubercles; lines of growth very fine and dense; besides the carination of the shoulder, there is on the base a slight angulation, and sometimes a number of low and distant spiral liræ. *Colour* light yellow, sometimes with a violet band. *Spire* high, conical, scalar, about the same height as the aperture with the canal. *Protoconch* of about three-quarters of a whorl, defined by a varix, surface polished; obtusely angled high up, the varix prominent up to this angle, tip of nucleus depressed. *Whorls* 6, slowly increasing, feebly angulated, with a sloping shoulder; base slightly constricted. *Suture* linear, a little impressed. *Aperture* oblong, rounded above, where to the right a canal runs out into the labial spine; pointed below, produced into a nearly straight, moderately long, open, and recurved canal. *Outer lip* arched, thin. *Columella* lightly concave. The *inner lip* continuous above with the outer lip; on the body it expands with a thin edge, which below, near the canal, rises into a thin lamina, and is then bent over to the inner edge of the canal.

Diameter, 11 mm. ; height, 24 mm.

Animal unknown.

Type in the collection of the J. de Conch., Paris.

Hab.—A single specimen, found at Waikanae Beach by Mr. T. W. Kirk, is in the Dominion Museum. Australia and Tasmania.

Fossil in the Pliocene.

This is *Typhis zealandica*, Hutton (C. Tert. M., 2). Adult specimens have the canal partly closed.

Var. eos, Hutton, 1873.

Murex eos, Hutton, C.M.M., 8 ; J. de Conch., xxvi, 12. *M. Angasi*, Crosse : Hutton, M.N.Z.M., 47 ; not of Crosse.

Distinguished from the species by its more robust and solid habitus, its bright yellowish-pink colour, and the somewhat larger size it attains. The base is always distinctly spirally unequally lirate, a character much less prominent and sometimes obsolete in the species.

Diameter, 10·5 mm. ; height, 25·4 mm. (type). Diameter. 14 mm. ; height, 27 mm. (large specimen).

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Bay of Islands (C. Traill).

Remarks.—This shell is not identical with *M. Angasi*, Crosse, but the differences are, in my opinion, not sufficient to entitle *M. eos* to specific rank. Since its discovery by the late Mr. C. Traill it has been found by many other collectors, and Mr. C. Cooper, of Auckland, was fortunate enough to find a live specimen.

Genus 2. Trophon, Montfort, 1810.

Trophon, Mtft., Conch. Syst., ii, 1810, 482. Type : *Buccinum Geversianum*, Pallas. *Muricidea*, Swainson, 1840 (in part).

Animal having the foot elongated oval, tentacles subulate, with the eyes near the base. Radula the same as in *Murex*.

Shell more or less fusiform, with numerous lamelliform or laciniated varices, the interstices smooth or spirally ribbed : spire prominent : aperture ovate ; canal open, usually turned to the left, moderately long ; columella smooth ; outer lip simple, with a tubercle close to the canal. Operculum shows in the larger species the peculiar rotating imprint on the proximal face which is usually regarded as characteristic of *Purpura*, but smaller species with thin opercula do not always develop this marking ; the nucleus is on the outer side, between the middle and lower angle, with a callus around the inner margin.

The species of the genus are found in austral and boreal seas. The latter show more variety, and have developed several types among themselves, all different from the antarctic group.

Fossil in the Upper Tertiary.

KEY TO SUBGENERA.

A. Shell with a basal fasciole and umbilical chink.
  a. Surface with lamelliform varices .. .. .. TROPHON, s. str.
  b. Surface without lamelliform varices, spiral sculpture predominating; outer lip with a tubercle near the canal .. .. XANTHOCHORUS.
  c. Surface axially costate and spirally lirate .. .. KALYDON.
B. Shell with a not prominent basal fasciole, no umbilical fissure, and very numerous axial lamellæ .. .. TROPHONOPSIS.

Subgen. 1. TROPHON, s. str.

Shell broadly ovate, rounded or strongly shouldered, with numerous sharp laminated varices, the interstices smooth or spirally ribbed; spire elevated; canal short, open, nearly straight; aperture rounded; outer lip simple; umbilicus usually open, with a prominent fasciole on the outer side.

KEY TO SPECIES.

A. Shoulder flat, nearly horizontal, its keel very little below the suture .. .. *ambiguus.*
B. Shoulder sloping, its keel at or below the middle of the spire-whorls .. .. *rugosus.*

1. Trophon ambiguus, Philippi, 1844. Plate 45, fig. 13.

Fusus ambiguus, Phil., Abbild. & Beschr. neuer Conch., Fusus, 1844, pl. i, f. 2; Voy. P.S., 109, pl. 25, f. 13, 14. *Trophon ambiguus*, Phil., Man. Conch. (1), ii, pl. 33, f. 365; M.N.Z.M., 48; T.N.Z.I., xvi, 219. *Fusus cretaceus*, Reeve, Conch. Icon., iv, 1847, f. 48; Man. Conch. (1), ii, pl. 33, f. 363. *Vitularia candida*, H. and A. Adams, P.Z.S., 1863, 430. *Murex* (*Vitularia*) *candida*, H. and A. Adams, Man. Conch. (1), ii, 133. *M. lyratus*, Lam.: Hutton, C.M.M., 7; not of Lamarck. *Fusus varius*, Lam.: Hutton, C.M.M., 9; not of Lamarck.

Shell fusiform, not very thick, usually with an umbilical chink, turriculate, reticulated by spiral and axial ribs. *Sculpture* consisting of 2 spiral ridges on the spire-whorls, the upper of which is on the carina of the whorls; interstices with an occasional finer ridge; body-whorl with numerous unequal spirals, some of which are usually more prominent than the others; a distinct fasciole along the canal; the axial sculpture formed by subequal sharp varices on the spire-whorls, very inequidistant and often almost obsolete on the body-whorl; the points of intersection, especially on the carina of the whorls, nodulous, or produced into short hollow spines. *Colour* white or yellowish; inside white, greenish, or light brown. *Spire* conical, shorter than the aperture with canal. *Protoconch* consisting of $2\frac{1}{2}$ convex and smooth whorls, the nucleus minute and rounded. *Whorls* 7 to 8, with a broad, flat, and but slightly sloping shoulder, lightly convex below it; base contracted towards the canal. *Suture* not much impressed. *Aperture* ovate, broadly angled above, produced below into a moderately long and open canal, which is recurved and bent to the left. *Outer lip* usually thin and sharp, but in old specimens it is often

much thickened inside; it is generally finely crenulated, but sometimes almost smooth; distinctly angled above, contracted on approaching the canal. *Columella* vertical, somewhat excavated. *Inner lip* thin, extending a short distance beyond the columella, and having a well-defined margin; it forms a more or less thick callous layer on the concave parietal wall, and is narrowed below to a fine and sharp ridge. The *fasciole* is well defined, lamellar. The *umbilical chink* is mostly distinct. *Operculum* with the nucleus subapical.

Diameter, 31 mm.; height, 56 mm.: angle of spire, 50°. Diameter, 19 mm.; height, 41 mm. (specimen from Wellington). Diameter, 35 mm.; height, 56 mm. (specimen from Lyttelton).

Dentition (Suter, J. Mal., vii, 55, pl. 3, f. 11).—The central tooth transverse, with 5 cusps, of which the median and externals are much larger, but all 5 are united at the base. Laterals angled and unicuspid.

Hab.—Throughout New Zealand, in the laminarian zone, but not common; very rare in the coralline zone: Bay of Islands; near Cuvier Island, in 38 fathoms (Captain Bollons); Wellington Harbour (H. S.); Lyttelton and Akaroa Harbours, in 2 to 6 fathoms (H. S.); Taumaki Island, in 10 fathoms (Captain Bollons); Stewart Island (C. Traill); near the Snares, in 50 fathoms (Captain Bollons); Kermadec Islands.

Fossil in the Pliocene.

2. **Trophon rugosus,** Quoy and Gaimard, 1833. Plate 45, fig. 14.

Purpura rugosa, Q. & G., Voy. Astrol., ii, 1833, 569, pl. 38, f. 19–21. *Fusus Stangeri*, Gray, Dieff. N.Z., 230; Hutton, C.M.M., 9; *Trophon Stangeri*, Gray, M.N.Z.M., 48; T.N.Z.I., xvi, 219; Index, 72. *Purpura Quoyi*, Reeve, Conch. Icon., iii, 1846, f. 71; not of Gray. *Trophon spiratum*, H. and A. Adams, P.Z.S., 1863, 428; Hutton, M.N.Z.M., 49; Tryon, Man. Conch. (1), ii, 147, pl. 33, f. 354. *Polytropa retiaria*, Hutton, J. de Conch., 1878, 20; M.N.Z.M., 57.

Shell ovato-fusiform, usually narrowly umbilicated, solid, strongly spirally ribbed and reticulated by axial plications, whorls keeled. *Sculpture* consisting of very prominent spiral ribs on the upper whorls, 1 on the keel, 2 additional less-prominent ribs between the keel and the suture above on the last two whorls, the upper of which margins the suture; body-whorl with 4 to 6 ribs below the keel, 4 of which are stout, a finer spiral is sometimes present below the keel and 1 below the fourth strong spiral, followed by a very distinct fasciole formed by former canals; the spirals reticulated by subequidistant much less prominent varices, the points of intersection nodulous; the whole shell ornamented with delicate axial foliations. *Colour* greyish or yellowish-white, interior purple. *Spire* conical, a little higher than the aperture without canal. *Protoconch* mostly much eroded, the nucleus minute and pointed. *Whorls* 6 to 7, strongly keeled below the middle, concave above and below the keel, the last whorl high; base flattish, somewhat contracted above the canal.

Suture superficial, uneven. *Aperture* ovate, subvertical, slightly channelled above, produced below into a short and open canal, which is mostly recurved and turned to the left; the length of the canal is very variable. *Outer lip* sharp, angled by the spiral sculpture, white, toothed within. *Columella* vertical and straight, lightly excavated towards the parietal wall. *Inner lip* extending a short distance beyond the columella, with a sharp and well-defined margin, spreading as a thin and white callus over the parietal wall, joining the outer lip; narrowed below to a fine edge, and forming the inner margin of the canal. *Umbilical chink* distinct, of variable depth. *Operculum* with the nucleus subapical.

Diameter, 18 mm.; height, 31·5 mm. (type). Diameter, 19 mm.; height, 34 mm. (large specimen).

Animal having an oval foot, a little broadened in front; tentacles large, conic, terminating in a sharp point, eyes near their extremities; they are whitish, and the short siphon is of the same colour. The sole of the foot is yellowish-white, the margins light brown; sides of foot greenish with yellowish-white spots.

Dentition (Hutton, T.N.Z.I., xv, 121, pl. 13, f. Q).—Central tooth with 5 narrow, pointed, separated denticles, the external and median subequal, the intermediate two much smaller.

Type in the Mus. Hist. Nat., Paris.

Hab.—From the Bay of Islands to Tauranga, on rocky ground between tide-marks.

Fossil in the Pliocene.

Subgen. 2. Xanthochorus, P. Fischer, 1884.

Xanthochorus, P. Fischer, Man. de Conch., 639. Type: *Trophon xanthostoma*, Brod.

Shell ventricose, with a short spire, devoid of varices, the spiral sculpture predominating; aperture oval, with a short and open canal below; outer lip sharp, toothed inside, with a more prominent tooth or tubercle close to the canal; fasciole not very prominent; umbilicus generally covered by the inner lip. Operculum with the nucleus anterior.

Key to Species.

A. Spire-whorls with 1, body-whorl with 5 slightly nodulous cinguli — *Cheesemani.*
B. Shell smooth or spire-whorls with 3 and body-whorl with 7–15 cinguli, crossed by growth-lines; interstices mostly linear .. — *patens.*
C. Spire-whorls with 2–3, body-whorl with 7 cinguli, the interstices nearly as broad as the ribs; with imbricating axial foliations — *squamata.*

3. **Trophon Cheesemani**, Hutton, 1882. Plate 46, fig. 15.

Polytropa Cheesemani, Hutt., N.Z.J.S., i, 1882, 69; T.N.Z.I., xv, 131. *Trophon Cheesemani*, Hutt., *l.c.*, xvi, 220; Index, 72. *Urosalpinx Cheesemani*, Hutt.: Cossmann, Ess. Pal. Comp., v, 50.

Shell small, ovate-fusiform, sometimes with a narrow umbilical chink, solid, whitish, spirally ribbed. *Sculpture* consisting of broad

flatly rounded spiral ribs, one on the spire-whorls, which is mostly distantly noduled; body-whorl with 5 ribs, slightly noduled and ornamented with fine microscopic striæ; interstices narrow, deep, with axial foliations; fasciole distinct, lamellate. *Colour* whitish, interior bright purple, outer and inner lip white. *Spire* conical, with an acute apex, of the same height as the aperture without canal. *Protoconch* depressed globular, white and smooth, of 1½ whorls, the last half carinated. *Whorls* 5, those of the spire small, the last large and ventricose, depressed and flat below the suture; base slightly contracted above the canal. *Suture* superficial, margined above. *Aperture* oval, subvertical, broadly angled above, narrowed below and produced into a short, oblique, and open canal. *Outer lip* sharp, thickened, crenulated by the spiral ribs, with 4 or 5 white teeth inside. *Columella* vertical, very lightly excavated, narrowed below to a fine ridge, margining the canal. *Inner lip* thin, widespread, extending over the concave parietal wall to the outer lip. *Umbilical chink* very narrow or covered by the lip. *Operculum* with the nucleus terminal.

Diameter, 9 mm.; height, 15 mm. (type).

Dentition.—Central tooth with 5 cusps, the median large, the outer 2 a little smaller, and the intermediate 2 minute.

Type in the Canterbury Museum, Christchurch.

Hab.—Port Waikato (T. F. Cheeseman).

Fossil in the Pliocene.

Remark.—The information about operculum and dentition were kindly supplied by Mr. W. H. Webster.

4. Trophon patens, Hombron and Jacquinot, 1854. Plate 45, fig. 15.

Purpura patens, H. & J., Voy. P.S., v, 1854, 85, pl. 22, f. 1, 2; Man. Conch. (1), ii, 177, pl. 54, f. 171. *Polytropa patens*, H. & J.: Hutton, M.N.Z.M., 57. *Trophon patens*, H. & J.: E. A. Smith, P. Mal. S., i, 57; Suter, J. Mal., vii, 56; Index, 72.

Shell ventricose, solid, umbilicus covered, spirally lirate to quite smooth. *Sculpture* consisting of close and more or less numerous flatly rounded spiral ribs, their number on the body-whorl varying from 7 to 15 in specimens not over 35 mm. in height; the interstices narrow, very often forming linear grooves only; very often the spirals are becoming obsolete or disappear altogether; the whole crossed by oblique growth-striæ; the fasciole distinct, lamellate. *Colour* white, cinereous, or light yellowish-brown; aperture reddish-brown within; outer lip and columella white. *Spire* usually short, conical, mostly lower than the aperture, but occasionally as high as the aperture with canal. *Protoconch* with a minute nucleus, the whorls carinated and minutely reticulated. *Whorls* 5, the last very large, very lightly convex, flat or somewhat depressed below the suture; base contracted above the fasciole. *Suture* not deep. *Aperture* oval, angled above,

produced below into a short, open, and slightly recurved canal. *Outer lip* convex, sharp, much thickened, denticulate or lirate inside, usually with a larger tooth near the canal. *Columella* vertical, straight. *Inner lip* spreading beyond the pillar, and as a thick callus over the concave parietal wall; a tubercle below the suture is mostly present; the lip is narrowed below and continued as the inner margin of the canal. There is a distinct *umbilical depression* between the fasciole and the canal. *Operculum* with a subapical nucleus.

Diameter, 16 mm.; height, 23 mm. (specimen from Greymouth). Diameter, 14 mm.; height, 20 mm. (specimen from Oamaru). Diameter, 21 mm.; height, 35 mm. (specimen from Stewart Island). Diameter, 31 mm.; height, 55 mm. (very large, Hauraki Gulf).

Dentition (Suter, J. Mal., vii, 56, pl. 3, f. 14).—Central tooth with the median denticle long, the 2 externals about half the length of the median, and those between the central and outer cusps minute; there are 5 cusps altogether.

Type in the Mus. Hist. Nat., Paris.

Hab.—The species is represented in my collection from the following localities: Stewart Island; Riverton; Brighton, Otago; Oamaru; Timaru (H. S.); Greymouth (R. Helms); Sumner (H. S.); Hauraki Gulf (H. S.). Found under boulders between tide-marks.

Remarks.—The species is polymorphous, the form of the shell being variable to some extent, but especially the sculpture; some specimens show strong spiral ribs, others only traces of them, whilst quite smooth shells occur in the same locality. The specimen I found in the Hauraki Gulf, which has a height of 55 mm., is a real giant of the species, and the only example known to me from the North Island.

5. Trophon squamatus, Hutton, 1878. Plate 19, fig. 3.

Polytropa squamata, Hutt., J. de Conch., 1878, 19; M.N.Z.M., 56; Man. Conch. (1), ii, 178. *Purpura rugosa*, Q. & G.: Hutton, C.M.M., 16: not of Quoy and Gaimard. *Polytropa striata*, Mart.: Hutton, T.N.Z.I., xvi, 222; not of Martyn. *Purpura striata squamata*, Hutt., Index, 72.

Shell rather small, ovato-acute, solid, imperforate, spirally ribbed and axially foliated, more or less distinctly shouldered. *Sculpture:* The first whorl is smooth, the second has a few radiate riblets, the third and fourth whorls have 2 spiral ribs, the upper one on the carina of the shoulder; crossed by distant axial ribs, points of intersection nodulous; the succeeding whorls have an additional spiral rib upon the shoulder, and the last has 7 cinguli; the lower whorls are ornamented with irregular, imbricating, and sinuous foliations; fasciole distinct. *Colour* white, the deep parts of the grooves light brown; mouth brownish-purple; outer lip and columella white. *Spire* sharp, conic, a little less in height than the aperture; outlines straight. *Protoconch* papillate, of 2 whorls, white and translucent. *Whorls* 7, first rather slowly increasing, slightly convex, more or less carinated

below the shoulder. *Suture* impressed. *Aperture* ovate, slightly oblique, produced below into a short, straight, and open canal. *Outer lip* rounded, rather thick, crenulated and grooved; adult specimens toothed inside, the tooth near the canal larger than the others. *Columella* slightly oblique, straight, drawn out to a narrow ridge towards the canal. *Inner lip* spreading but little beyond the pillar, extending as a thin callosity over the concave parietal wall. *Operculum* with the nucleus apical.

Diameter, 10 mm.; height, 17 mm.

Animal unknown.

Type in the Otago University Museum, Dunedin.

Hab.—Dunedin Harbour (type); Oamaru; Cape Egmont (R. Murdoch); Banks Peninsula (Iredale).

Remark.—Diagnosis drawn up from the type, kindly lent for the purpose by Professor W. B. Benham.

Subgen. 3. Kalydon, Hutton, 1884.

Kalydon, Hutt., T.N.Z.I., xvi, 1883 (1884), 220. Type: *K. corticatus*, Hutt. (= *duodecimus*, Hutt.; not of Gray).

Shell purplish or yellowish-brown, shortly fusiform, longitudinally ribbed or undulated, and spirally striated. Operculum ovate, with the nucleus subapical. Dentition as in *Trophon*. (Hutton.)

In this subgenus the varices are replaced by axial ribs. Dr. H. Strebel's group of *Trophon decolor*, Phil. (Zool. Jahrb., Syst., xxi, 209), seems to me to coincide with this subgenus.

Key to Species.

A. Whorls convex, not distinctly shouldered; with 10 strong rounded axial ribs .. .. *convexus*.
B. Whorls distinctly shouldered.
  a. Without distinct axial ribs. Body-whorl with 3 nodulous keels and 4 spiral liræ on the base .. .. *waipipicola*.
  aa. Axial ribs distinct.
    b. Number of axial ribs varying from 10 to 12.
      c. Protoconch smooth; axial ribs 11–12; penultimate whorl with 4 cinguli .. .. *aucklandicus*.
      cc. Protoconch with spiral sculpture.
        d. With 12 broadly rounded axial ribs; about 6 spiral liræ on the penultimate whorl.. *corticatus*.
        dd. With 10–11, rarely 12, axial ribs; 2 spiral cords on the penultimate whorl .. *curtus*.
    bb. Number of axial ribs varying from 8 to 9.
      c. 9 axial ribs on body-whorl only, sometimes obsolete; many spiral cords; a strong not nodulous keel at the shoulder .. .. .. *inferus*.
      cc. Penultimate whorl with 3, body-whorl with 9 spiral cords .. .. *erectus*.
      ccc. 8–9 broadly rounded axial ribs, crispate growth-lines, carina of shoulder nodulous; many spiral cords .. .. *Paivæ*.
    bbb. Number of axial ribs about 18, reticulated by spiral cords, 3 (rarely 4 or 5) on the penultimate whorl .. *plebejus*.

6. **Trophon aucklandicus**, E. A. Smith, 1902. Plate 46, fig. 18.

Euthria aucklandica, E. A. Smith, "Southern Cross" Moll., 1902, 203, pl. 24, f. 12, 13. *Trophon aucklandicus*, E. A. Smith: Suter, P. Mal. S., viii, 254, pl. 11, f. 3, 4.

Shell small, fusiform, moderately solid, turreted, brown, axially costate and spirally lirate. *Sculpture* consisting of rounded axial costæ, 11 to 12 on a whorl, obsolete on the shoulder, crossed by distant spiral liræ, which pass over the ribs, 4 on the penultimate and about 9 on the body whorl, the lowest three or four more conspicuous than the others; there are traces of additional fine spiral striæ and growth-lines. Fasciole not very prominent. *Colour* reddish-brown, inside of aperture darker, columella whitish or light brown. *Spire* elevated conic, turreted, its height variable, usually a little more than the height of the aperture without canal. *Protoconch* minute, of 1 smooth convex whorl, mammillate. *Whorls* 6, regularly increasing, lightly excavated upon the shoulder, convex below; base contracted above the canal. *Suture* superficial. *Aperture* vertical, ovate, angled above, with a moderate oblique open canal, which is slightly recurved. *Outer lip* thin and sharp, toothed inside or smooth. *Columella* vertical, very little arcuate. *Inner lip* narrow, spreading over the parietal wall, narrowed below. *Operculum* with the nucleus subapical.

Diameter, 4·5 mm.; height, 9·5 mm.; length of aperture with canal, 5 mm.

Dentition. (Plate 19, fig. 4)—Central tooth with 5 cusps, the central and outer ones large, the intermediate cusps minute. Laterals falcate.

Type in the British Museum.

Hab.—Auckland Islands, 10 fathoms (type); Te Oneroa, Preservation Inlet; Campbell Island (Captain Bollons).

Remark.—The shell has mostly a thick covering of nulliporites, obscuring the sculpture.

7. **Trophon convexus**, Suter, 1909. Plate 19, fig. 5.

Trophon convexus, Suter, Rec. Canterbury Museum, i, No. 2, 1909, 126, pl. 12, f. 4.

Shell very small, fusiform, thin, axially costate and spirally lirate. *Sculpture* consisting of strong broadly rounded axial costæ, about 10 on a whorl, extending from suture to suture but absent on the base, crossed by distant and prominent spiral cords, with a few intercalated fine threads upon the neck of the canal, produced into oval nodules upon the axial ribs; the spire-whorls with a fine thread below the suture, margining it, and 3 distant strong spirals below it; body-whorl with 14 to 15 cinguli, those upon the base not nodulous; fasciole hardly discernible. *Colour* yellowish-brown, neck of canal and inner lip whitish, interior of aperture light brown. *Spire* acuminate, conic, of the same height as the aperture with canal. *Protoconch* papillate,

of 1½ smooth and convex whorls, the globular nucleus slightly lateral. *Whorls* 5, regularly increasing, convex; base contracted towards the canal. *Suture* but little impressed, undulating, margined below. *Aperture* subvertical, ovate, angled above, produced below into a moderately long, oblique, and slightly recurved widely open canal. *Outer lip* thin and sharp, convex, crenulated by the spiral sculpture, smooth inside. *Columella* vertical, straight, twisted and narrowed below. *Inner lip* thin and narrow, extending over the excavated parietal wall, drawn out to a narrow ridge towards the inner margin of the canal. *Operculum* unknown.

Diameter, 3·5 mm.; height, 7 mm.

Animal unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—Off south-east of Cape Saunders, in 100 fathoms (E. R. Waite).

Remarks.—This species is nearly allied to *T. curtus*, but it is larger, has the whorls not shouldered, no colour-bands, and the strong spiral on the neck of the canal is also wanting; the protoconch has convex, not carinated, whorls.

8. Trophon corticatus, Hutton, 1873. Plate 46, fig. 16.

Fusus corticatus, Hutt., C.M.M., 9. *Trophon Paivæ*, Crosse: Hutton, M.N.Z.M., 49; not of Crosse. *Kalydon duodecimus*, Gray: Hutton, T.N.Z.I., xvi, 220. *Trophon duodecimus*, Gray: Hutton, Plioc. M., 39, pl. 6, f. 7; Index, 72, not of Gray.

Shell small, fusiform, solid, yellowish or brown, spirally lirate and axially costate. *Sculpture* consisting of distant broadly rounded axial costæ, about 12 on a whorl, sometimes getting obsolete on the last whorl, crossed by spiral mostly very unequal and flatly rounded liræ, the narrow grooves between them often with laminated growth-lines; fasciole distinct, lamellate; sculpture mostly more or less hidden by a thick growth of nulliporites. *Colour* yellowish, sometimes the spirals purplish or uniformly purplish-brown, inside whitish or brown. *Spire* high, narrowly conic, usually higher than the aperture with canal. *Protoconch* papillate, of 2½ convex whorls, the nucleus smooth, the rest spirally lirate. *Whorls* about 8, first slowly descending, generally distinctly shouldered, convex below; base contracted above the canal. *Suture* not deep, lightly undulating. *Aperture* subvertical, narrowly oval, angled above, produced below into a short and open canal, which is slightly recurved and bent to the left. *Outer lip* sharp, crenulated by the spiral ribs, toothed or lirate within, slightly angled above. *Columella* vertical, almost straight, drawn out to a fine edge toward the canal. *Inner lip* rather broad, extending over the concave parietal wall. A narrow *umbilical chink* is sometimes present. *Operculum* with a subapical nucleus.

Diameter, 9·5 mm.; height, 19 mm.

Dentition (Hutton, T.N.Z.I., xv, 118, pl. 13, f. D, as *T. Paivæ*).—Central tooth with 5 cusps, the median and distal ones larger than the others.

Type in the Dominion Museum, Wellington.

Hab.—North and South Islands, but not common and local; Whangaroa Harbour (C. Traill); Sumner and Akaroa (H. S.); Foveaux Strait, in 15 fathoms; Chatham Islands (R. Buddle).

Remarks.—This species was classed by its author first as a synonym of *T. Paivæ*, Crosse, and, four years later, of *T. duodecimus*, Gray. From the former it is distinct, though nearly allied. What *Fusus duodecimus*, Gray (Dieff. N.Z., 230) is it is difficult to say, as Gray's diagnosis is quite inadequate, the species has never been figured, and the type is not to be found in the British Museum. The late Professor E. von Martens suggested that it was a young specimen of *Euthria littorinoides*, Reeve (Errata and Addenda to C.M.M., 1874, 1), whilst Hutton said that "Dr. Gray's description is a compound of *T. Paivæ* and *Euthria rittata*, Q. & G." (T.N.Z.I., xvi, 220). It seems probable that Gray's species is really the young of either *Euthria littorinoides* or *E. rittata*, and not a *Trophon* at all.

Fossil in the Pliocene.

9. Trophon curtus, Murdoch, 1905. Plate 19, fig. 6.

Trophon curtus, Murdoch, T.N.Z.I., xxxvii, 1904 (1905), 228, pl. 8, f. 22.

Shell small, ovate, rather solid, spirally and axially ribbed. *Sculpture* consisting of 10 to 11, rarely 12, axial costæ, usually narrower than the interspaces and more prominent than the spiral sculpture, which is formed by spiral liræ, 2 on the spire-whorls and 6 to 7 on the body-whorl; occasionally there are 3 and 8 spirals respectively; the lowest spiral frequently much stronger than the others; points of intersection produced into prominent nodules, which, however, are sometimes obsolete; fasciole distinct. *Colour* whitish, occasionally a brown band on the base, rarely a few ill-defined scattered spots on the periphery, aperture whitish. *Spire* conical, turreted, a little higher than the aperture with the canal. *Protoconch* of 2 whorls, smooth, except the last half-turn, upon which 2 small spirals arise; very often both whorls are strongly keeled. *Whorls* 6, lightly shouldered, convex below; base contracted above the canal. *Suture* indistinct. *Aperture* vertical, ovate, broadly angled above, produced below into a short, oblique, and open canal. *Outer lip* slightly expanded, angled above, rather thick, sometimes feebly dentate within. *Columella* vertical, almost straight. *Inner lip* thin and narrow, extended over the lightly excavated parietal wall, narrowed below towards the canal. *Operculum* unknown.

Diameter, 2·6 mm.; height, 5·7 mm. (type).

Dentition unknown.

Type in the Dominion Museum, Wellington.

Hab.—Whangaroa Harbour, type (C. Traill); near Channel Island, Hauraki Gulf, in 25 fathoms; Foveaux Strait and Stewart Island; Takapuna (H. S.); Bounty and Snares Islands, in 50 fathoms (Captain Bollons).

10. Trophon erectus, Suter, 1909. Plate 19, fig. 7.

Trophon erectus, Suter, Subantarctic Islds. N.Zeal., i, 1909, 27. *T. columnaris*, Suter, P. Mal. S., viii, 178, pl. 7, f. 1; not *T. columnarius*, Hedley, 1908.

Shell very small, turreted, fusiform, thin, with a sharp spire, very strong axial ribs and distant spiral cords. *Sculpture* consisting of distant high and rounded axial ribs, obsolete on the shoulder and the lower part of the base; about 9 on a whorl, crossed by rather distant spiral cords, absent upon the shoulder, 3 on the spire-whorls, and about 9 on the body-whorl, the lowest of which is more prominent; they pass over the axial ribs, usually without becoming nodulous; fasciole not very well marked. *Colour* fulvous, rarely with a white band below the angle of the whorls; aperture light brown inside. *Spire* elevated conic, turreted, of the same height as the aperture with canal. *Protoconch* small, papillate, of 1½ smooth and convex whorls, the globose nucleus slightly excentric. *Whorls* 6, regularly increasing, with a narrow concave shoulder, convex below; base contracted above the canal. *Suture* not deep, undulating. *Aperture* oblique, narrowly oval, broadly angled above, produced below into a short, slightly oblique, and recurved open canal. *Outer lip* sharp, strengthened by an axial rib, angled above, smooth inside. *Columella* vertical, straight, twisted and narrowed below. *Inner lip* thin and narrow, spreading over the lightly excavated parietal wall, narrowed below. There is no *umbilical fissure*. *Operculum* unknown.

Diameter, 4·3 mm.; height, 8·3 mm.

Animal unknown.

Type in my collection.

Hab.—Near the Bounty Islands (type) and Snares, in 50 fathoms (Captain Bollons).

Remark.—This shell has the aspect of a miniature of *T. Paivæ*; however, the axial sculpture is bolder, and the spirals are more distant and much less numerous in consequence.

11. Trophon inferus, Hutton, 1873. Plate 46, fig. 17.

Fusus inferus, Hutt., C.M.M., 9. *Trophon inferus*, Hutt., J. de Conch., 1878, 13; M.N.Z.M., 48; Man. Conch. (1), ii, 145. *Kalydon inferus*, Hutt., T.N.Z.I., xvi, 221.

Shell small, ovato-fusiform, fairly solid, spirally lirate, the last whorl sometimes costate. *Sculpture* consisting of fine spiral riblets, the interstices shallow, a little broader than the riblets, and containing sometimes a fine spiral thread; on the last whorl irregularly spaced

flatly rounded axial ribs are sometimes present, but they may be absent and replaced by numerous indistinct narrow ribs, rendering the spirals slightly nodulous; fasciole distinct. *Colour* chestnut-brown, the grooves usually cinereous; the shoulder of the whorls sometimes whitish; aperture brown inside. *Spire* of the same height as the aperture or higher, conical. *Protoconch* broken off in all specimens I have seen. *Whorls* 5, distinctly shouldered and sometimes carinated, the last ventricose, convex below the shoulder, much contracted above the canal. *Suture* superficial. *Aperture* broadly ovate, subvertical, broadly angled above, with a short open oblique canal, bent to the left. *Outer lip* sharp, slightly crenulated by the spirals, smooth inside, angled above. *Columella* vertical, very little excavated. *Inner lip* narrow, extending over the lightly convex parietal wall, and narrowed towards the inner margin of the canal. There is no *umbilical fissure*. *Operculum* unknown.

Diameter, 18 mm.; height, 28 mm. (type). Diameter, 13 mm.; height, 24 mm. (specimen from Te Onepoto).

Dentition unknown.

Type in the Dominion Museum, Wellington.

Hab.—Stewart Island (type); Chatham Islands; Te Onepoto, near Lyttelton (H. S.).

12. **Trophon Paivæ**, Crosse, 1864. Plate 45, fig. 22.

Trophion Paivæ, Crosse, J. de Conch., xii, 1864, 278, pl. 11, f. 7; Hutton, M.N.Z.M., 49. *Urosalpinx Paivæ*, Crosse, Man. Conch. (1), ii, 155, pl. 39, f. 495, 499. *Peristernia Paivæ*, Crosse: Tate, T.R.S. S.Aust., x, 1888, 154. *Kalydon Paivæ*, Crosse: Hedley, Mem. A.M., iv, 1903, 380. *Trophon Hanleyi*, Angas, P.Z.S., 1867, 110, pl. 13, f. 1. *Fusus Hanleyi*, Ang., Chall. Rep., xv, 194. *Trophon australis*, T.-Woods, P.R.S. Tas., 1875 (1876), 136. *T. Assisi*, T.-Woods, *l.c.*, 1876 (1877), 132. *T. squamosissima*, T.-Woods, *l.c.*, 1878 (1879), 33.

Shell small, fusiform, short broad and solid, or long slender and rather thin, angled at the shoulder, axially distantly costate and spirally lirate. *Sculpture* consisting of 8 to 9 broadly rounded axial ribs, extending over the greater part of the base, crossed by numerous subequal spiral threads, sometimes obsolete upon the shoulder, the whole shell ornamented with fine crispate growth-lamellæ; fasciole distinct, lamellate. *Colour* grey or light brown, white or purple within the aperture. *Spire* elevated conic, of the same height as the aperture with canal. *Protoconch* of 2 axially finely costate whorls, the nucleus small, pointed. *Whorls* 6 to 7, shouldered and straight or lightly convex below the carina; base contracted towards the canal. *Suture* not deep. *Aperture* subvertical, oval, angled above, produced below into a short or moderately long open and somewhat recurved canal. *Outer lip* sharp, crenulated by spiral sculpture, smooth or dentate inside, angled above and contracted below. *Columella* vertical, straight. *Inner lip* extending a little beyond the

pillar, well limited, spreading over the concave parietal wall, narrowed below to a fine ridge on reaching the canal. An *umbilical narrow chink* is sometimes present. *Operculum* with a terminal nucleus.

Diameter, 13 mm.; height, 26 mm. (typical form). Diameter, 15 mm.; height, 31 mm. (elongated form).

Dentition unknown.

Type.—Collection of J. de Conch., Paris.

Hab.—North and South Islands, but not common, between tide-marks to about 20 fathoms; Chatham Islands. Also Australia and Tasmania.

Remarks.—This species is very variable, according to its habitat. The short and solid form is living on rocks at low water; the thin and slender shell inhabits mud-flats; and *T. squamosissima* is an extreme form from deep water. (C. Hedley.)

13. Trophon plebejus, Hutton, 1873. Plate 46, fig. 19.

Fusus plebeius, Hutt., C.M.M., 9. *Trophon plebeius*, Hutt., J. de Conch., 1878, 12; Man. Conch. (1), ii, 145; Plioc. M., 39, pl. 6, f. 6. *Kalydon plebeius*, Hutt., T.N.Z.I., xvi, 220. *Urosalpinx plebeius*, Hutt.: Cossmann, Ess. Pal. Comp., v, 50. *Trophon incisus*, Gould: Hutton, M.N.Z.M., 48; not of Gould.

Shell small, fusiform, solid, with reticulated sculpture, cinereous to dark brown. *Sculpture* consisting of narrow rounded or sharp axial costæ, about 18 on a whorl, reticulated by spiral liræ; usually 3, but occasionally as many as 5, on the spire-whorls; points of intersection slightly nodulous; fasciole distinct. *Colour* dark brown, sometimes with a white spiral band below the shoulder; inside of aperture brownish-purple, sometimes whitish with brown bands; inner lip light brown. *Spire* conic, of about the same height as the aperture with canal. *Protoconch* small, of 1½ smooth and convex whorls, the nucleus minute, globular. *Whorls* 6, the last high, shouldered, more or less distinctly angled; base contracted above the canal. *Suture* superficial. *Aperture* subvertical, oval, angled above, with a short open canal below, which is bent to the left and somewhat recurved. *Outer lip* with an angle above, crenulated by the spiral sculpture, sharp, grooved or toothed inside. *Columella* vertical, straight. *Inner lip* narrow, limited by a fine groove, extending as a thin layer over the lightly excavated parietal wall, narrowed below towards the canal. A very small *umbilical fissure* is sometimes present. *Operculum* with a subapical nucleus.

Diameter, 10 mm.; height, 20 mm. (type). Diameter, 8 mm.; height, 16 mm. (usual size).

Dentition not known.

Type in the Dominion Museum, Wellington.

Hab.—Throughout New Zealand, between tide-marks and in the laminarian zone, common; Kermadec Islands.

Fossil in the Pliocene.

14. Trophon waipipicola, Webster, 1906. Plate 19, fig. 8.

Trophon waipipicola, Webster, T.N.Z.I., xxxviii, 1905 (1906), 310, pl. 39, f. 3.

Shell small, fusiform, turreted, with noduled keels, grey. *Sculpture:* A noduled keel on the second and third whorl, a second row appearing on the fourth and fifth in the suture; the body-whorl has 3 keels, the middle one being the smallest; the nodules are lengthened in a spiral direction, and are situated on axial buttresses, which are faint towards the suture and the base; there are no spiral striæ between the keels; on the base are 4 spirals, the lowest being the strongest; fasciole distinct, lamellate. *Colour* grey, columella brown. *Spire* elevated conical, tabulated, of about the same height as the aperture with canal. *Protoconch* small, of 1½ smooth whorls, the last half angled. *Whorls* 7, first slowly then more rapidly increasing, broadly shouldered and keeled, outlines straight; base very little contracted above the canal. *Suture* not much impressed. *Aperture* subvertical, oval, rounded above, produced below into a short straight and open canal. *Outer lip* sharp, angled by the keels, smooth inside. *Columella* smooth, slightly concave. *Inner lip* narrow, spreading over the lightly excavated parietal wall, drawn out to a fine ridge below. *Operculum* with the nucleus apical.

Diameter, 5 mm.; height, 10 mm. (type).

Dentition (Webster, *t.c.*, 310, pl. 39, f. 3*b*).—Central tooth with 5 cusps, the central and the outer ones much larger than the intermediate two. Laterals arcuate, unicuspidate.

Type in the collection of Mr. W. H. Webster.

Hab.—Waipipi, Manukau Harbour, on mud-flat (type).

Subgen. 4. Trophonopsis, Bucq., Dollf., Dautzenb., 1882.

Trophonopsis, Bucq., Dollf., Dautzenb., Moll. Mar. Roussillon, i, 40. Type: *Murex muricatus*, Mont.

Shell small, elongated fusiform; protoconch smooth, polygyrate; whorls convex or angular, with numerous varices, crossed by spiral cords, the points of intersection produced into spiny scales; fasciole not prominent, no umbilical chink; outer lip strongly crenulate; canal moderately long, much twisted. Operculum with a nearly apical nucleus.

Key to Species.

A. Shell of 5 whorls more than 10 mm. high; 18 sharp axial ribs and 13 spiral cords on the body-whorl .. .. *Bonneti.*

B. Shell of 5 whorls less than 10 mm. high.

a. Numerous sharp, mostly crispate, axial riblets, and 5 spiral cords on the body-whorl .. .. *crispulatus.*

aa. 11 rounded axial riblets, and 10 spiral cords on the body-whorl .. .. *pusillus.*

15. Trophon Bonneti, Cossmann, 1903. Plate 45, fig. 23.

Trophon (*Trophonopsis*) *Bonneti*, Cossm., Ess. Pal. Comp., v, 1903, 200, pl. 3, f. 7. *T. Stangeri*, Gray: Hutton, Plioc. M., 38; not of Gray. *T. ambiguus pumila*, Suter, J. Mal., vii, 1899, 55· Index, 72.

Shell small, fusiform, rather thin, reticulated by axial and spiral sculpture, whitish, turreted. *Sculpture* consisting of numerous narrow and sharp varices, sometimes composed of a few crenate lamellæ, extending over the whole base; they are crossed and reticulated by subequidistant spiral cords, alternately stronger and finer on the body-whorl; there are often 1 or 2 fine spirals on the shoulder of the whorls, 1 on the keel and 1 below it on the upper whorls, penultimate whorl with 2 strong and 2 fine cords below the shoulder, body-whorl with about 13 cords; the points of intersection somewhat nodulous and with raised scales; fasciole present, lamellate, not prominent. *Colour* white, aperture white. *Spire* elongated conic, turreted, of the same height as the aperture with canal. *Protoconch* with the nucleus small and smooth. *Whorls* 7, convex, distinctly shouldered and carinated; base much contracted above the canal. *Suture* superficial. *Aperture* oval, subvertical, angled above, with a moderately long and open canal, which is oblique and strongly recurved. *Outer lip* thin, crenulated by the spirals, grooved inside. *Columella* vertical, lightly excavated. *Inner lip* narrow and thin, spreading broadly over the somewhat arcuate parietal wall, narrowed below to a narrow ridge. *Operculum* with the nucleus subapical.

Diameter, 12 mm.; height, 25 mm. (type, from the Pliocene).

Dentition.—Suter, J. Mal., vii, 56, pl. 3, f. 13.

Type in Mr. Bonnet's collection, Paris.

Hab.—Stewart Island, in 15 fathoms.

Remark.—As Mr. Cossmann's diagnosis of the species was accompanied by a figure, I give preference to the name proposed by him for this species.

Fossil in the Pliocene.

16. **Trophon crispulatus**, Suter, 1908. Plate 19, fig. 9.

Trophon crispulatus, Suter, P. Mal. S., viii, 1908, 178, pl. 7, f. 2.

Shell very small, fusiform, turreted, very thin, white, translucent, reticulated by numerous axial crispate varices and a few spiral liræ. *Sculpture* consisting of close fine and sharp varices, usually 20 to 25 on a whorl, but occasionally their number is reduced to about 15; they are either straight or strongly crispate lamellæ, retractive on the shoulder, but vertical below it; on the base they extend as fine striæ upon the neck of the canal; they are reticulated by distinct spiral threads, sometimes, however, inconspicuous, the points of crossing raised into sharp short spines; the spire-whorls with 3 spirals, the first carinating the shoulder; body-whorl with 5 cinguli, the lower part of the base without spirals; the interstice between the first and second spiral is always broader than the succeeding ones; fasciole minute, transversely striated. *Colour* white. *Spire* conical, turreted, higher than the aperture with canal. *Protoconch* small, papillate, of $1\frac{1}{2}$ smooth and convex whorls, the globose nucleus slightly lateral. *Whorls* 5, regularly increasing, shouldered and keeled; base con-

tracted above the canal. *Suture* well impressed, the varices passing across it. *Aperture* somewhat oblique, oval, biangulate above, with a short slightly oblique and recurved open canal. *Outer lip* sharp, prominently angled above, a little strengthened by the last varix, smooth inside. *Columella* subvertical, straight, twisted and tapering below. *Inner lip* very thin and narrow, polished, spreading over the lightly excavated parietal wall, narrowed below to a fine point. *Operculum* unknown.

Diameter, 1·9 mm.; height, 4 mm.

Animal unknown.

Type in my collection.

Hab.—Near the Snares, in 50 fathoms, type (Captain Bollons); 21½ miles north-east of Wreck Reef, Stewart Island, in 50 to 54 fathoms (E. R. Waite); twenty-four miles south-east of Long Point, in 120 fathoms (E. R. Waite).

Remark.—Allied to the Pliocene *T. Gouldi*, Cossmann (= *crispus*, Hutton, not of Gould), which, however, is a larger shell, with much less axial costæ, more spirals, and the outer lip strongly dentate within.

17. Trophon pusillus, Suter, 1907. Plate 19, fig. 10.

Trophon pusillus, Suter, T.N.Z.I., xxxix, 1906 (1907), 253, pl. 9, f. 2; Iredale, T.N.Z.I., xl, 384.

Shell small, fusiform, fairly solid, imperforate, with nodulous varices. *Sculpture* formed by spiral ribs and varices, produced into oval nodules at the points of intersection; there are 11 varices on the last whorl, reticulating the spiral sculpture; 2 spirals on the upper whorls succeeding the protoconch, 3 on the penultimate, and 10 on the last whorl; from the base of the fourth whorl minute and close radiate striæ are beginning to ornament the whole surface, most of the nodules, however, remaining partly smooth. *Colour* yellowish-white. *Spire* conical, a little shorter than the aperture with canal. *Protoconch* mammillate, smooth, consisting of 3 strongly convex whorls. *Whorls* 6, lightly shouldered, base concave. *Suture* impressed, undulate. *Aperture* elongately pyriform, produced into a comparatively long canal, which is subtruncate and slightly deflexed to the right. *Outer lip* thin and sharp, crenulated by the spiral sculpture. *Columella* vertical, straight, obliquely truncate below, terminating in a sharp point on reaching the left margin of the canal. *Inner lip* forming a rather narrow callosity, with a longitudinal furrow parallel to the margin on the outer side. *Operculum* unknown.

Diameter, 3·5 mm.; height, 6 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Near Channel Island, Hauraki Gulf, in 25 fathoms (type); near Cuvier Island, in 38 fathoms (Captain Bollons); Lyttelton Harbour (Iredale).

Genus 3. Typhis, Montfort, 1810.

Typhis, Mtft., Conch. Syst., ii, 1810, 614. Type: *Murex tubifer*, Brug. (Eocene). *Hirtotyphis*, Jousseaume, 1879.

Animal similar to that of *Murex*. Mantle-margin prolonged into the last tubular spine, which is an avenue of escape for effete matter voided from the intestine.

Shell oval-oblong, small, with spinose varices, usually 4 on a whorl, between which hollow tubes are intercalated. which are formed by a fold, its edges appressed so closely that the shelly secretion forms a perfect cylinder; in some species the varix commences with and at the tube, though mostly developed beyond it; spire elevated; aperture oval or circular; peristome continuous in typical species; canal short, closed; columella smooth. Operculum oval, nucleus apical.

Not many species are known; they have been found in the Mediterranean, Cape of Good Hope, west coast of Africa, West Indies, Indian Archipelago, China, Japan, Gulf of California, Australia, Tasmania, &c.

Fossil in the Tertiary.

The length of both the tube proper and the tubular canal is greater when it is first formed than later. It seems to be soon dissolved by the water, or broken off. The last tube, until it is broken, is therefore always longer than the others. Specimens from the quiet abyssal waters occasionally preserve the tubes, or part of them, in a way to make this evident. (W. H. Dall.)

T. Cleryi, Sow., is ascribed to New Zealand by Tryon and Watson, and enumerated by Hutton in his Manual, but later, in his "Revision on of the Rhachiglossate Mollusca of New Zealand," omitted as not inhabiting New Zealand.

A small specimen was dredged in 110 fathoms, off Great Barrier Island, but unfortunately in too bad a condition for identification (T.N.Z.I., xxxviii, 302). This is the only New Zealand specimen of *Typhis* I have seen. There is only one fossil species known from New Zealand: *T. Maccoyi*, T.-Woods (*T. hebetatus*, Hutton, T.N.Z.I., ix, 594, pl. 16, f. 1), from the Pareora system. *T. zealandica*, Hutt., 1873, from the Pliocene, is *Murex Angasi*, Crosse.

Fam. THAISIDÆ.

Purpuridæ, Broderip.

Animal having a moderate posteriorly obtuse foot; the eyes usually placed near the tips of the tentacles; siphon short.

Shell strong, buccinoid; surface without varices, but mostly with nodules or tubercles; siphonal canal wanting or only very short, the base usually only deeply notched; columella flattened, little excavated, very often plicate. Operculum horny, lamellate, with an external medio-lateral nucleus.

Key to Genera.

A. Whorls spirally ridged, the ridges sometimes nodulous; aperture wide; outer lip crenate or lightly denticulate; siphonal canal absent or short .. .. Thais.
B. Whorls tubercular or spinose; aperture narrow; outer lip with strong teeth within; columella wrinkled or plicate .. .. Drupa.

Genus 1. Thais, Bolten, 1798.

Thais, Bolten, Mus. Bolten., 1798, 54. First species: *Purpura neritoides*, Lamarck. *Purpura*, Lamarck, 1799; not of Martyn, 1784. *Lepsia*, Hutton, 1884. (For full synonymy, see W. H. Dall, U.S. Geol. Survey, Professional Paper 59—"The Miocene of Astoria and Coos Bay, Oregon," 1909, 46.)

Animal with a short foot, truncated in front; head small and broad; tentacles long, with the eyes on the outer side near the anterior third. Radula long, the central tooth with 3 principal cusps and a few marginal denticles on each side; laterals claw-shaped.

Shell solid, ovate or suborbicular, more or less turreted, body-whorl very large; surface sculptured with striations or sulcations, usually spirally, often forming fimbriated ridges, and sometimes broken up into nodules or tubercles; fasciole more or less prominent; aperture ovate, dilated, notched or with a short canal below; outer lip crenated or denticulated; columella flattened, callous, sometimes subexcavated.

Distribution.—About 60 species are known; they are found in most seas, but the maximum occurs in the tropics.

Fossil in the Tertiary.

Vernacular Name.—Dog-winkle.

Key to Subgenera.

A. Shell without a siphonal canal, simply notched .. .. Thais.
B. Shell with a rudimentary canal, columella nearly straight, slightly twisted below .. .. Stramonita.
C. Shell with a recurved canal and prominent fasciole, columella strongly twisted below, separated from the fasciole by an umbilical depression .. .. Nucella.

Subgen. 1. Thais, s. str.

Type: *Purpura neritoides*, Lamarck.

Animal as in the genus. Dentition $1+\frac{1}{5}+1$, the middle cusp of the central tooth very long, the middle side cusps small, and the lateral cusps larger; marginal teeth long and pointed.

Shell oblong-oval, whorls smooth; last whorl very large, the aperture occupying three-fourths of the height of the shell; spire short; aperture ovate; columella flattened; outer lip lirate within.

1. Thais haustrum, Martyn, 1784. Plate 48, fig. 3.

Buccinum haustrum, Mart., Un. Conch., i, 1784, f. 9. *Purpura haustrum*, Mart., Voy. Astrol., ii, 554, pl. 37, f. 4–8; Dieff. N.Z., 233; C.M.M., 16; Crit. List, 21; J. de Conch., 1878, 19; M.N.Z.M., 56; Man. Conch. (1), ii, 160, pl. 43, f. 25; Conch. Icon., iii, pl. 2, f. 6. *Polytropa* (*Lepsia*) *haustrum*, Mart.: Hutton, T.N.Z.I., xvi, 222. *Purpura* (s. str.) *haustrum*, Mart.: Baker, Bull. Chicago Acad. Sci., ii, 1895, 182, footnote. *Buccinum haustorium*, Gmel., Syst. Nat., ed. xiii, i, 1790, 3498.

Shell ovato-oblong, ventricose, solid, with a depressed spire and wide aperture. *Sculpture* formed by smooth close spiral lirae, separated by shallow linear grooves; young shells have deeper grooves and crispate growth-lamellae; sometimes obsolete axial ribs, produced into rounded nodules upon the angle of the whorls, are present, disappearing, however, in the adult shell; fasciole narrow, distinct. *Colour* grey or purplish-brown; interior greyish-white, with a broad band of brownish-purple on the outer lip, the edge white; columella white, a brown patch on the parietal wall. *Spire* low, concave above, about one-third the height of the aperture. *Protoconch* subcylindrical, of about 2 smooth whorls, the nucleus minute; in adult specimens the protoconch is almost always lost by erosion. *Whorls* 7 to 8, more or less distinctly shouldered, the shoulder concave on the first three whorls below the protoconch, flat or lightly convex on the later whorls, the last whorl large, high and ventricose, convex; base flattish. *Suture* superficial. *Aperture* large, oval, rounded above, with a very short and widely open canal below. *Outer lip* regularly convex, lightly and broadly angled above, sharp, crenulated by the spiral sculpture, lirate within. *Columella* vertical, somewhat excavated above, flattened; smooth, and tapering to a fine point below. *Inner lip* large, polished, spreading over the inner and upper part of parietal wall as a thick callus, leaving a brown patch free. *Fasciole* slightly detached from the inner lip. *Operculum* dark brown, oval, the outer side convex, the inner nearly straight; nucleus lateral, interior with gyratory scars.

Diameter, 39 mm.; height, 62 mm.

Animal having a large quadrangular foot; the tentacles large, nearly cylindrical, obtuse, the eyes near the ends. Colour white.

Dentition (Troschel, Das Gebiss d. Schnecken, ii, 132, pl. 12, f. 20; Hutton, T.N.Z.I., xv, 120, pl. 13, f. 0).—Central tooth with 5 cusps, the median longest, the middle side cusps slightly shorter than the lateral cusps. Lateral teeth long and pointed.

Type lost.

Hab.—Throughout New Zealand, but more common in the south; Chatham Islands. On rocks between tide-marks. Brought to England by Captain Cook.

Remark.—Hutton mentions a variety in which the whole of the interior is yellow; hab., Dunedin. I have not seen it.

Maori.—Kakara (*fide* Captain Bollons).

Subgen. 2. Stramonita, Schumacher, 1817.

Stramonita, Schum., Essai d'un Nouv. Syst., 1817, 226. Type: *Purpura hæmastoma*, L.

Shell ovoid-conic; spire moderately elevated; whorls nodulous, reticulated in the interspaces between the spiral ribs; aperture oval, large, with a channel above, sometimes limited by a spiral rib, and a basal canal, which is rudimentary, very little contracted, and deeply notched; outer lip lirate and subdentate within; columella nearly vertical, slightly twisted below; inner lip flattened, not excavated.

Key to Species.

A. Shell large, white or light brown, with predominating spiral ribs and without axial costæ .. .. *succincta.*
B. Shell small, fulvous with darker bands, with about 12 distinct axial costæ .. .. *tritoniformis.*

2. Thais succincta, Martyn, 1784. Plate 48. fig. 4.

Buccinum succinctum, Mart., Un. Conch., ii, 1784, f. 45. *Purpura succincta*, Lam., A.s.V., ed. 2, x, 62; Kiener, Coq. Viv., Purpura, 1836, 105; Reeve, Conch. Icon., iii, pl. 5, f. 23; Krauss, Südafr. Moll., 1848, 118; Dieff. N.Z., 232; C.M.M., 16; M.N.Z.M., 56; T.N.Z.I., xvi, 221; Man. Conch. (1), ii, 170, pl. 51, f. 118–120, 107, 125, 113. *Buccinum orbita*, Gmelin, Syst. Nat., ed. xiii, 1790, 3490. *Purpura textilioso*, Lam., A.s.V., vii, 1822, No. 24; Blainville, Ann. de Mus., i, 1832, 249; Voy. Astrol., ii, 1833, 552, pl. 37, f. 1–3; Kiener, Coq. Viv., Purpura, 1836, 104; Reeve, Conch. Icon., iii, pl. 12, f. 66; C.M.M., 16; M.N.Z.M., 56; T.N.Z.I., xvi, 221. *P. succincta*, Mart.: Pritchard and Gatliff, P.R.S. Vic., x (n.s.), 258.

Shell large, ovate-ventricose, solid, spirally ribbed, aperture large, white. *Sculpture* consisting of 8 distant rounded spiral ribs, with a few fine grooves, the interstices of the same width as the ribs, deeply excavated and with traces of a few spiral threads (typical *succincta*); or the interstices shallow, much broader than the ribs, with numerous (up to 6) unequal spiral cords, the whole crossed by fine crispate growth-lamellæ, reticulating the spirals in the interstices (typical *textiliosa*); fasciole prominent, separated from the inner lip by a broad and moderately deep groove, both transversely lamellate. *Colour* white or light brown; outer lip yellowish-white inside, banded with white and brown in the brown-coloured specimens. *Spire* low, gradate, conoidal, usually a little more than half the height of the aperture. *Protoconch* small, papillate, of 2½ convex and smooth whorls. *Whorls* about 8, first slowly increasing, the last large, ventricose; there is a distinct flattish or concave depression below the suture, last whorl convex; base very little contracted below. *Suture* impressed on the upper whorls, frequently channelled further down. *Aperture* large, oval, channelled above, with a rudimentary widely open canal below. *Outer lip* convex, thick, crenulated by the spirals and grooved inside. *Columella* oblique, broad, somewhat excavated, lightly twisted below

towards the canal, where it ends in a straight and rounded ridge. *Inner lip* broad, polished, forming a thick callosity on the parietal wall, broadly expanded, and with a rounded edge towards the depression below the fasciole. *Operculum* ovate-triangular, dark brown, with the nucleus lateral.

Diameter, 42 mm.; height, 64 mm. Diameter, 73 mm.; height, 118 mm. (large specimen).

Animal having a large dilated oval foot, brownish-white on the sides, sole yellowish-white; tentacles thick, short, and conical, violaceous brown, eyes near the extremity.

Dentition (Hutton, T.N.Z.I., xv, 120, pl. 13, f. P).—Central tooth with 3 long triangular cusps, the median of which is the largest.

Type lost.

Hab.—North Island; Cook Strait; Nelson. Brought to England by Captain Cook. Also Tasmania, Australia, Lord Howe Island, Cape of Good Hope.

Fossil in the Pliocene.

Remarks.—This species is very variable in size and sculpture, all intermediate varieties between *succincta* and *textiliosa* being met with; the finer ornamented form, however, is much more common. The nature of their habitat is most likely influencing the sculpture to some extent. These molluscs are mostly found in clusters of about half a dozen together, in crevices of rocks near low-water mark.

Maori.—Tawiri (*fide* Captain Bollons).

3. Thais tritoniformis, Blainville, 1833. Plate 45, fig. 19.

Purpura tritoniformis, Blainv., Nouv. Ann. du Mus., i, 1833, 221, pl. 10, f. 10; Kiener, Icon. Coq. Viv., Purpura, 1836, 37, pl. 8, f. 18; Kesteven, P.L.S. N.S.W., xxvi, 1902, 533, pl. 29; Hedley, Mem. A.M., iv, 384; Index, 72. *Cominella* (*Agnewia*) *tritoniformis*, Blainv.: Pritchard and Gatliff, P.R.S. Vic., x (n.s.), 275. *C. typica*, Dunker, P.Z.S., 1856, 357. *Adamsia typica*, Angas, P.Z.S., 1867, 192. *Agnewia typica*, Dkr.: T.-Woods, P.R.S. Tas., 29. *Cominella* (*Adamsia*) *typica*, Dkr.: Chall. Rep., xv, 214. *Urosalpinx tritoniformis*, Blainv., Man. Conch. (1), ii, 156, pl. 39, f. 491.

Shell small, fusiform, rather thin, axially costate and spirally finely lirate, fulvous, often with dark bands. *Sculpture* consisting of numerous equidistant rounded and sometimes nodulous axial ribs, extending over the base, about 12 on a whorl; the interstices of about the same width as the ribs; crossed by very numerous close inequidistant spiral threads, passing over the ribs, mostly 2 to 4 closer together, leaving only one cord in the interspace; on the base they are sometimes stronger and more equidistant, ornamenting also the very distinct fasciole. *Colour* yellowish-brown, with narrow dark-brown spiral bands, 3 on the penultimate and 6 to 8 on the body whorl; aperture yellowish-white inside, occasionally banded with brown. *Spire* elevated conic, slightly turreted, about the same height

as the aperture. *Protoconch* small, of 4 smooth and convex whorls, nucleus minute. *Whorls* 8 to 9, first slowly increasing, the last high; they are convex and mostly very lightly shouldered; base somewhat contracted below. *Suture* superficial, slightly undulating. *Aperture* subvertical, oval, lightly channelled above, with a very short straight and open canal below. *Outer lip* convex, sharp, crenulated outside, thickened and dentate within. *Columella* vertical and straight, twisted and tapering below. *Inner lip* broad, extending over the lightly concave parietal wall, usually with a small tubercle below close to the canal. *Operculum* with a lateral nucleus.

Diameter, 12 mm.; height, 24 mm.

Animal.—The anatomy has, I believe, been studied by Kesteven, but I have not seen his publication.

Hab.—Bay of Islands; Cook Strait. Also Tasmania and Australia, in depths from 10 to 80 fathoms.

Remark.—The New Zealand habitat of the species was first mentioned by the late Justice Gillies (T.N.Z.I., xiv, 1882, 171).

Subgen. 3. Nucella, Bolten, 1798.

Nucella, Bolten, Mus. Bolten., 1798, 131 (in part, *Cancellaria* excluded). Type: *Purpura lapillus*, L. *Polytropa*, Swainson, 1840; not of Defrance. *Polytropalicus*, Rovereto, 1899.

Animal with a small foot; other characters as in the genus. Dentition $1+\frac{1}{3}+1$, the cusps of the central tooth large and of equal size.

Shell elongately oval; whorls foliated or tuberculose; spire acuminate; the last whorl rounded, excavated above the prominent fasciole; aperture oval, very little channelled above, produced below into a moderate contracted and recurved canal; outer lip smooth or lirate within; columella arcuate, strongly twisted below; inner lip rather narrow, more or less separated from the fasciole by an umbilical depression.

Key to Species.

A. Shell with 9 strong spiral ribs on the body-whorl, interstices narrow; white .. .. *striata.*
B. Shell either with 3 prominent spiral ribs or more than 9 fine narrow cinguli on the body-whorl; brown or orange with white .. *scobina.*

4. Thais striata, Martyn, 1784. Plate 45, fig. 18.

Buccinum striatum, Mart., Un. Conch., i, 1784, f. 7; not of Pennant, 1777. *Purpura striata*, Mart., Dieff. N.Z., 232; Crit. List, 21; Malak. Blätter, xix, 1872, 23; Miss. I.C., 526. *Polytropa striata*, Mart.: Hutton, J. de Conch., 1878, 19; M.N.Z.M., 56; T.N.Z.I., xvi, 221. *Buccinum lacunosum*, Bruguière, Ency. Méth. (Vers.) (1), 1789, 258. *Purpura rugosa*, Lam., A.s.V., vii, 1820, 242. *P. rupestris*, Valenciennes, Voy. "Venus," Moll., pl. 9, f. 1; Voy. P.S., 89, pl. 22, f. 23.

Shell ventricose with an elevated spire, solid, white, spirally lirate. *Sculpture* consisting of flatly convex spiral ribs, 4 on the penultimate, 9 on the body whorl, the deep interstices narrower than the ribs,

sometimes adorned with a fine spiral thread, crossed by irregular sharp and oblique growth-lamellæ, mostly worn off on the ribs; fasciole prominent, lamellate. *Colour* white or yellowish-white, aperture white or brown within, porcellanous. *Spire* elevated conic, variable in height, usually the same as the aperture; outlines lightly convex. *Protoconch* minute, papillate, of $1\frac{1}{2}$ smooth convex whorls. *Whorls* 6, the last high and ventricose, convex, base flattened and somewhat contracted above the neck of the canal. *Suture* canaliculate. *Aperture* subvertical, oval, subchannelled above, with a short open and recurved canal below, its base notched. *Outer lip* thick, crenulated by the spirals, toothed and lirate inside, the entire outline convex. *Columella* vertical, lightly concave, a little twisted and tapering below, broadly flattened. *Inner lip* moderately broad, extending broadly over the excavated parietal wall, which bears a longish tubercle below the suture; the lip is narrowed below, with a free and sharp edge towards the fasciole. *Operculum* ovate, with the nucleus sublateral.

Diameter, 19 mm.; height, 30 mm. (specimen from Te Onepoto).
Diameter, 27 mm.; height, 38 mm. (specimen from Te Onepoto).
Diameter, 25 mm.; height, 41 mm. (specimen from Auckland Islands)
Diameter, 20 mm.; height, 32 mm. (specimen from Campbell Island).

Animal white; siphon short, open below; foot expanded anteriorly.

Dentition (Hutton, T.N.Z.I., xv, 121, pl. 13, f. R).—Central tooth with 5 cusps, the median one isolated from the others, and sometimes much longer.

Type lost.

Hab.—From Cook Strait southward, on rocks near low-water mark and in deeper water; Chatham Islands; near the Bounty Islands, in 50 fathoms, embryonic shells (Captain Bollons); Auckland Islands; Campbell Island. Brought to England by Captain Cook. Also Kerguelen's Land.

5. Thais scobina, Quoy and Gaimard, 1833. Plate 45, fig. 20.

Purpura scobina, Q. & G., Voy. Astrol., ii, 1833, 567, pl. 38, f. 12, 13: Dieff. N.Z., 233; M.N.Z.M., 57; T.N.Z.I., xvi, 222; Man. Conch. (1), ii, 170, pl. 51, f. 123; pl. 52, f. 126; Chall. Rep. xv, 173.

Shell rather small, ovato-oblong, solid, turriculate, strongly spirally ribbed, the ribs with hollow spines or nodules, grey with brown markings. *Sculpture* consisting of prominent spiral ribs, 1 on the spire-whorls and 3 on the body-whorl, a few spiral threads sometimes on the shoulder and in the interstices; they are adorned with regularly spaced hollow spines or tubercles, 9 to 10 on a whorl; the whole surface ornamented with close laciniate growth-lamellæ; fasciole present, strongly lamellate. *Colour* grey, brown, or white; the scales and nodules usually dark brown; aperture blue inside, with a broad chocolate-brown band margined with white inside the outer lip; columella chocolate-brown; parietal wall with a black patch on the

outer side. *Spire* conical, variable in height, usually the same as that of the aperture, or a little less. *Protoconch* pupoid, of 2 whorls, the first smooth, the second axially costate. *Whorls* 6 to 7, first slowly increasing, the last rather large, distinctly shouldered, and keeled by the first spiral rib; base contracted above the fasciole. *Suture* impressed, uneven. *Aperture* slightly oblique, narrowly oval, angled above, with a short open slightly recurved canal below. *Outer lip* sharp, laciniate, crenate and lirate inside, the liræ sometimes lighter in colour. *Columella* vertical, lightly concave, somewhat twisted and tapering below. *Inner lip* extending somewhat beyond the pillar and broadly over the parietal wall, much narrowed towards the base. *Operculum* with the nucleus sublateral.

Diameter, 13·5 mm.; height, 27 mm. (type).

Dentition (Hutton, T.N.Z.I., xv, 121, pl. 13, f. S).—Central tooth with 5 subequal cusps.

Type in the Mus. Hist. Nat., Paris.

Hab.—North Island to Cook Strait, on rocks between tide-marks, common. Tryon says that it occurs at the Cape of Good Hope, and it appears also in Gibbons's "List of South African Mollusca," 1888.

Subsp. albomarginata, Deshayes, 1839. Plate 45, fig. 21.

Purpura albomarginata, Desh., Rev. Zool. Soc. Cuv., 1839, 360; Deshayes, in Guérin Mag. Zool., 1841, pl. 44; Man. Conch. (1), ii, 170, pl. 51, f. 121, 124; Chall. Rep., xv, 173; T.N.Z.I., xvi, 222. *Purpura tristis*, Dunker, V.Z.B.G. Wien, xvi, 1866, 910; Reise "Novara," Moll., 6, pl. 1, f. 4, 1867. *Polytropa biconica*, Hutton, J. de Conch., 1878, 20; M.N.Z.M., 57, not of Anton.

This subspecies is of the same size as the species; the whorls are less prominently shouldered and not keeled; the conspicuous spiral ribs are wanting, and are replaced by numerous dark-coloured subequidistant spiral threads, the interstices of about the same width as the threads and usually white; the axial sculpture consists of laciniate or smooth and oblique growth-lamellæ, producing a rough or sometimes quite smooth surface; outer lip with a white margin, almost always banded with brown and white.

Dentition.—Hutton, T.N.Z.I., xv, 121, pl. 13, f. T.

Type.—Mus. Hist. Nat., Paris (?).

Hab.—Abundant throughout the South Island, less common in the North Island.

Var. rutila, Suter, 1899.

Purpura scobina rutila, Suter, J. Mal., vii, 1899, 55.

Differs from the typical form, in which the interior is brown or blackish-brown, by having this part of the shell coloured orange or brownish-orange, the columella fulvous, and the epidermis of the shell light-brown or cinereous, with a hue of yellow. Sculpture and size very variable.

Type in my collection.

Hab.—Te Onepoto, near Lyttelton, type (H. S.); Kawau Island (C. Spencer).

Genus 2. Drupa, Bolten, 1798.

Drupa, Bolten, Mus. Bolten. (2), 1798, 55. Type: *Ricinula horrida*, Lam. *Canrena*, Link, 1807. *Sistrum*, Montfort, 1810. *Ricinule*, Lamarck, 1812. *Ricinula*, Lam., 1816. *Ricinella*, Schumacher, 1817. *Morula*, Schumacher, 1817.

Animal and radula the same as in *Thais*.

Shell ovate or subfusiform, solid; whorls tubercular, spinose, or longitudinally costate; aperture narrow, oblong, canaliculate above, with a short canal below; outer lip furnished with strong teeth within; inner lip wrinkled or plicated. Operculum oval, straight, with lateral nucleus.

The genus is essentially Polynesian in distribution, but occurs also in Australia, Tasmania, &c.

Fossil in the Tertiary; not in New Zealand, but an Eocene species is known from Tasmania.

1. **Drupa Bollonsi**, Suter, 1906. Plate 19, fig. 11.

Purpura striata, subsp. *Bollonsi*, Sut., T.N.Z.I., xxxviii, 1905 (1906), 331. *Drupa Bollonsi*, Sut., P. Mal. S., viii, 254, pl. 11, f. 5–7.

Shell rather small, ovate, solid, white, with nodulous cinguli. *Sculpture* consisting of strong, somewhat unequal, flatly convex spiral ribs, 3 on the penultimate and 7 on the body whorl, generally composed of 4 to 6 fine spiral threads, the interstices usually a little narrower than the ribs, containing sometimes a fine spiral thread; the cinguli are cut up into distinct nodules by more or less deep axial sulci; growth-lines close, oblique, lamellar, reticulating the fine spiral sculpture; fasciole distinct, lamellar, leaving a deep groove between it and the inner lip. *Colour* yellowish-white, aperture white within, the outer lip sometimes yellowish or light purple. *Spire* conic, very variable in height, mostly a little less than the height of the aperture. *Protoconch* minute. *Whorls* about 6, flatly convex on the spire, the body-whorl usually more convex, contracted above the fasciole. *Suture* well impressed. *Aperture* subvertical, ovate, channelled above, produced below into a short open and deeply notched canal. *Outer lip* convex, crenulate, much thickened inside, very strongly dentate-lirate. *Columella* subvertical, almost straight, twisted and tapering below. *Inner lip* moderately broad, very broadly extended over the somewhat concave parietal wall, which bears a small tubercle below the suture, with 3 transverse median folds; excavated below, with a free edge bending over the groove margining the fasciole. *Operculum* with the nucleus lateral.

Diameter, 19 mm.; height, 32 mm. (largest specimen, 6 whorls). Diameter, 16 mm.; height, 22 mm. (small specimen, 6 whorls).

Dentition.—Central tooth with a long simple median cusp, followed on each side by a quadridentate cusp, with the median tooth large, the inner denticle much smaller, and the outer two minute; towards the margin there are on each side 4 small denticles, the distal one a little larger.

Type in my collection.

Hab.—Bay of Islands (J. C. Anderson); L'Espérance or French Rock, Kermadecs, type (Captain Bollons). Lord Howe Island.

Fam. **CANCELLARIIDÆ**, Adams.

Animal having the eyes at the outer bases of the tentacles; snout short; foot small; siphon short. Radula with 2 rows of subulate narrow teeth; no central tooth; formula 1 + 0 + 1.

Shell ovoid, sometimes subturriculate; protoconch paucispiral, globular; surface generally cancellate; aperture more or less triangular, usually canaliculate above and with a rudimentary canal below; outer lip thick or varicose, crenate or toothed inside; columella more or less concave, with 2 or 3 plaits, the lowest of them very often absorbed in the twist of the columella. There is no operculum.

Genus 1. Admete, Kröyer, 1842.

Admete, Kröyer, Index Moll. Groenl., 1842. Type: *A. viridula*, Fabr.

Shell oval, thin, diaphanous, with epidermis, mostly small, without fasciole and umbilicus; whorls always spirally lirate, mostly cancellated by axial riblets, convex or shouldered; spire conic, sharp; protoconch smooth, small, obtuse; aperture oval, not channelled above, with a very short notched canal below; columella with 3 equal and oblique plaits, the lowest coinciding with the twist of the columella and continued into the basal beak; outer lip thin, smooth inside.

The genus is arctic and subantarctic in its distribution. From the Southern Hemisphere it is recorded from Chile, the Strait of Magellan, Kerguelen's Land, and New Zealand.

Fossil from the end of the Cretaceous.

Remark.—Dr. J. Thiele found only one longitudinal row of teeth in the radula of *Cancellaria Verreauxi*, Kiener; and also a jaw, but no radula, in *Admete viridula*, Fabr. (Die beschalten Gastrop. d. deutsch. Tiefsee Exped., 1903, p. 171, 172).

1. Admete Trailli, Hutton, 1873. Plate 19, fig. 12.

Cancellaria Trailli, Hutt., C.M.M., 26; J. de Conch., 1878, 25; M.N.Z.M. 46; P.L.S. N.S.W., ix, 936; Plioc. M., 58, pl. 7, f. 52, Index, 71.

Shell small, oval, thin, semitransparent, cancellated, more or less distinctly turreted, white. *Sculpture* consisting of numerous close, sometimes unequal, flatly convex spiral liræ, the interstices very often with a fine spiral thread, crossed by equidistant low axial riblets, disappearing on the base, the crossing-points raised into oval low

nodules, the whole surface ornamented with fine and dense growth-lines. *Colour* white, the protoconch usually brown. *Epidermis* thin, light horn-colour. *Spire* short, acuminate, conic, turreted, its height a little less than that of the aperture. *Protoconch* of $1\frac{1}{2}$ smooth and convex whorls, the nucleus globular. *Whorls* 5, regularly increasing, more or less distinctly shouldered, sometimes sharply angled, the last ventricose; base slightly contracted below. *Suture* not deep. *Aperture* oblique, narrowly oval, angled above, with a very short widely open canal below, which is notched at the base. *Outer lip* moderately convex, angled above, thin and sharp, crenate on the outside, slightly lirate inside. *Columella* vertical, with 3 low rounded and oblique plaits, the lowest continued on the twist of the columella to the beak. *Inner lip* indistinct, or forming only a very thin callous layer, extending over the convex parietal wall, which is excavated on meeting the columella.

Diameter, 4·25 mm.; height, 6·25 mm. (type). Diameter, 4·5 mm.; height, 7·5 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Stewart Island, 15 fathoms (type); near the Snares, in 50 fathoms (Captain Bollons).

Fossil in the Pliocene.

Fam. **PYRENIDÆ.**

Columbellidæ, Adams.

Animal very similar to that of the *Buccinidæ*. Radula with the central tooth transverse, semilunar, without cusps or denticles; lateral teeth transverse, flexuous, tricuspidate, the cusps short, the median and outer one nearer together, subterminal; formula 1 + 1 + 1.

Shell small, imperforate, suboval or turriculate, smooth or ornamented; protoconch paucispiral, subglobular; aperture generally narrow, with a short canal; outer lip almost always thickened or varicose, crenate inside; columella but little excavated, twisted and more or less plicated below; inner lip mostly plicate.

This family is well characterized by the radula. The central tooth recalls certain forms of *Buccinidæ*, but the lateral teeth are quite peculiar.

Key to Genera.

A. Canal very short, indistinct, or wanting.
  a. No canal. Shell mitriform, smooth or longitudinally plicate; columella smooth or with a few anterior rugosities; outer lip smooth or crenulated within .. .. .. Mitrella.
  aa. With a short canal.
    b. Shell oval-fusiform, axially ribbed, sometimes trellised; columella smooth or rugose; outer lip sometimes varicose .. .. Anachis.
    bb. Shell fusiform, spirally sculptured, rarely smooth; columella with a single oblique fold at the base .. Alcira.
B. Canal moderately long, straight. Shell fusiform, smooth or longitudinally plicate; last whorl suddenly narrowed into a beak or canal .. .. Atilia.

Genus 1. Mitrella (Risso, 1826), Mörch, 1859.

Mitrella, Risso, Hist. Nat. Europe Mérid. iv, 247. No type specified.
Mitrella, Mörch, 1859. Type: *Murex scriptus*, Linné. *Angulatomitrella* and *Arcuatomitrella*, Sacco, 1889.

Shell small, narrowly elongated; spire high, acute, smooth, conical; protoconch paucispiral, nucleus obtuse; whorls almost flat and the suture linear; the last whorl not ventricose, oval, attenuated below and but little contracted, sometimes with a few spiral grooves on the short neck; aperture small, the margins not parallel, the height not more than the total height of the shell, lightly channelled above, without a canal below, truncated and moderately notched; outer lip nearly vertical, not varicose, crenate inside, not thickened in the middle; columella straight, smooth, slightly twisted below; inner lip but little callous, sometimes with a few unequal ridges. Operculum horny.

Distribution.—Mediterranean, Antilles, Pacific Ocean, &c.

Fossil in the Tertiary.

Key to Species.

A. Height of spire about the same as that of the aperture.
  a. Surface smooth, a few spirals at the base.
    b. Body-whorl moderately convex; outer lip often crenate within .. .. *choava.*
    bb. Body-whorl ventricose; outer lip smooth within *stephanophora.*
  aa. Surface with faint microscopic spiral lines; suture false-margined .. .. *leptalea.*
  aaa. Surface with spiral cords, interstices linear; suture simple .. .. *Websteri.*
B. Height of spire about 1½ times that of the aperture.
  a. Surface smooth, a few spirals at the base.
    b. Spire-whorls flat; outer lip denticulate; suture false-margined .. .. *pseudomarginata.*
    bb. Spire-whols convex; outer lip smooth; suture linear .. .. *rosea.*
  aa. Surface with a few microscopic spiral lines and a few varices; body-whorl angled .. .. .. *paxillus.*
  aaa. Surface with dense microscopic spiral lines, decussated by growth-lines; body-whorl convex .. *subantarctica.*

1. **Mitrella choava**, Reeve, 1859. Plate 19, fig. 13.

Columbella choava, Rve., Conch. Icon., xi, pl. 37, f. 239; Crit. List, 22; M.N.Z.M., 61; T.N.Z.I., xvi, 223; Man. Conch. (1), v, 137, pl. 51, f. 51. *Pyrene flexuosa*, Hutton, J. de Conch., 1878, 23; T.N.Z.I., x, 295; Murdoch, T.N.Z.I., xxxvii, 225. *P. choava*, Reeve: Iredale, T.N.Z.I., xl, 385.

Shell very small, elongated, smooth, fulvous or dark brown with variable colour-markings. *Sculpture* consisting of a few spiral ridges on the lower part of the base only; growth-lines very fine and almost straight. *Colour* very variable: *a*, dark brown without any markings; *b*, dark brown with a pale band below the periphery of the body-whorl; *c*, dark brown with a light band below the suture on

all whorls except the protoconch, and a peripheral band on the body-whorl; *d*, dark brown with distant triangular white spots below the suture on the last 3 whorls, sometimes accompanied by a band below the periphery of the last whorl, composed of close white spots; *e*, yellowish or greenish-white with longitudinal flexuous brown lines—they may form a brown peripheral band on the spire-whorls and one on the base of the body-whorl. *Epidermis* thin, but faintly shining. *Spire* elevated and narrowly conic, of the same height as the aperture or but slightly higher; outlines straight or very lightly convex. *Protoconch* of $1\frac{1}{2}$ smooth whorls, nucleus depressed globose. *Whorls* 6, regularly increasing, but faintly convex; base slightly contracted below. *Suture* linear. *Aperture* subvertical, narrow, moderately channelled above, open and truncated below, slightly notched. *Outer lip* somewhat thickened and smooth or crenate within, straight, and curved towards the base. *Columella* straight, a little twisted below. *Inner lip* narrow, with a sharp free edge in adult specimens. According to Hutton, there is no *operculum*.

Diameter, 3 mm.; height, 6·5 mm.

Animal yellowish-white, with a narrow black longitudinal line on the back of the head, between the eyes; some scattered dead-white spots on the body and siphon. Tentacles thick, not tapered, approximated; the eyes at their outer bases. Siphon curved. Foot expanded in front and notched at each side. (Hutton, T.N.Z.I., xiv, 163, pl. vii, f. O.)

Dentition (Hutton, *l.c.*, 163, pl. 7, f. P).—Formula 1+0+1; the central portion of the radula is thickened, and divided transversely into membranous plates, which are broader than long, but the plates bear no teeth. The lateral teeth are versatile; they are curved, pointed at the end, and with 2 denticles on the concave side.

Type in the British Museum (Cuming collection).

Hab.—Throughout New Zealand, under stones and on seaweeds, near low-water mark to a depth of about 20 fathoms.

Remarks.—The specimens from deep water are much smaller, the height sometimes not more than 4 mm. Hutton's *P. flexuosa* is the colour variety mentioned under *e*. The operculum and also the central tooth of the radula being usually very small, they may have been overlooked. Iredale found constantly a dark shell paired with a light one, and thinks that the change of coloration in this species may be a sexual characteristic.

Fossil in the Pliocene.

2. Mitrella leptalea, Suter, 1908. Plate 19, fig. 14.

Mitrella leptalea, Suter, P. Mal. S., viii, 1908, 180, pl. 7, f. 6.

Shell small, subulate, smooth, shining, thin, pellucid, yellowish. *Sculpture* consisting of almost obsolete fine microscopic spiral striæ and a few faint spiral ridges on the lower part of the base; growth-

lines fine, straight. *Colour* light-yellowish. *Spire* subulate, a little higher than the aperture; outlines nearly straight. *Protoconch* small, papillate, the nucleus somewhat oblique. *Whorls* 5, regularly increasing, very lightly rounded, the last convex, contracted at the base. *Suture* linear, false-margined below. *Aperture* narrow, angled above, slightly contracted below, but without a canal. *Outer lip* thin and sharp, smooth inside, lightly convex, somewhat contracted below. *Columella* vertical, a little convex. *Inner lip* narrow, smooth, spreading as a very thin glaze over the lightly arcuate parietal wall. *Operculum* unknown.

Diameter, 1·8 mm.; height, 4·5 mm.

Animal unknown.

Type in my collection.

Hab.—Near the Bounty (type) and the Snares Islands, in 50 fathoms (Captain Bollons); Foveaux Strait, in 15 fathoms.

3. Mitrella paxillus, Murdoch, 1905. Plate 19, fig. 15.

Columbella paxillus, Murd., T.N.Z.I., xxxvii, 1904 (1905), 224; pl. 7, f. 14.
Pyrene paxillus, Murd.; Iredale, T.N.Z.I., xl, 385.

Shell small, subulate, slender, smooth, brown. *Sculpture* consisting of a few small spirals at the anterior end of the body-whorl; a few irregular microscopic spiral lines may be present on some of the whorls, but very often they are wanting; a few axial riblets, periods of rest, are visible on the spire-whorls. *Colour* light brown or reddish-brown or almost black, the suture occasionally a little lighter. *Spire* subulate, about $1\frac{1}{2}$ times the height of the aperture; outlines straight. *Protoconch* of 2 convex whorls, smooth and polished, papillate. *Whorls* $5\frac{1}{2}$ to 6, lightly convex, the last lightly angled at the periphery; base very little contracted. *Suture* impressed. *Aperture* short, oval, angled above, somewhat narrowed below, but without a canal; base very lightly notched. *Outer lip* strongly arched, smooth within, sharp. *Columella* lightly arcuate, vertical, somewhat twisted below. *Inner lip* narrow and thin, spreading over the faintly concave parietal wall. *Operculum* unknown.

Diameter, 2 mm.; height, 5 mm. (type).

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Whangaroa Harbour, type (C. Traill); Whangarei Heads; Takapuna; Manukau Harbour; Kawhia; New Plymouth; Lyttelton Harbour (Iredale).

Remark.—Specimens I collected near Tamaki Heads are not so slender as the type; adult specimens are 2·5 mm. by 6 mm.

4. Mitrella pseudomarginata, Suter, 1908. Plate 19, fig. 16.

Mitrella pseudomarginata, Suter, P. Mal. S., viii, 1908, 179, pl. 7, f. 4.

Shell small, subulate, smooth and polished, translucent, whitish with light-brown zigzag markings. The only *sculpture* consists of a

few spiral ridges on the neck of the base. *Colour* yellowish-white with fulvous zigzag markings, interrupted on the body-whorl by a narrow whitish spiral band below the periphery; lower part of base white. *Spire* high, acuminate, conic, about 1½ times the height of the aperture; outlines straight. *Protoconch* papillate, of 1½ smooth whorls. *Whorls* 6, regularly increasing, flat; body-whorl lightly convex, contracted below. *Suture* linear, false-margined, as is very often the case in *Eulima*. *Aperture* slightly oblique, narrow subchannelled above, but little narrowed below, without a canal. *Outer lip* vertical, rounded below, thickened and denticulate within. *Columella* vertical, slightly bent to the left below. *Inner lip* narrow and smooth, very thin on the straight parietal wall. *Operculum* unknown.

Diameter, 2·75 mm.; height, 6·6 mm.

Animal unknown.

Type in my collection.

Hab.—Bay of Islands.

5. Mitrella rosea, Hutton, 1873. Plate 19, fig. 17.

Obeliscus roseus, Hutton, C.M.M., 22; J. de Conch., 1878, 24; M.N.Z.M., 72; P.L.S. N.S.W., ix, 935. *Pyramidella rosea*, Hutt.: Suter, T.N.Z.I., xxxiv, 214; Index, 74. *Columbella pseutes*, Suter, T.N.Z.I., xxxviii. 1905 (1906), 329.

Shell small, subulate, thin, smooth, pink or purple, usually with 1 or 2 white spiral bands. The only *sculpture* consists of a few spiral ridges on the lower part of the base, and very fine straight growth-lines. *Colour* pinkish or purplish-brown, generally with a white spiral band below the suture on the spire-whorls and one on the periphery of the body-whorl; the neck of the base also white, but sometimes there is a white band above the suture and only 1 central band on the body-whorl, the neck not white; occasionally there are no spiral bands at all. *Spire* high, acute, conic, about 1½ times the height of the aperture; outlines straight. *Protoconch* obtuse, of 1½ smooth flatly convex whorls, the nucleus depressed globose. *Whorls* 6, regularly increasing, but faintly rounded; base flattish, lightly contracted. *Suture* linear. *Aperture* small, oval, lightly channelled above, slightly narrowed below, base moderately notched. *Outer lip* subvertical, convex below, sharp, smooth inside. *Columella* vertical, very little twisted below. *Inner lip* narrow, smooth, with a sharp outer edge, spreading as a thin glaze over the flat parietal wall. *Operculum* unknown.

Diameter, 2·5 mm.; height, 5 mm. (type).

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Stewart Island (type); Hauraki Gulf (H. S.); Cook Strait: Auckland Islands (Professor W. B. Benham); Snares, in 50 fathoms (Captain Bollons).

6. Mitrella stephanophora, Suter, 1908. Plate 19, fig. 18.

Mitrella stephanophora, Suter, P. Mal. S., viii, 1908, 179, pl. 7, f. 3.

Shell small, ovoid, smooth and polished, translucent, yellowish, with 2 spiral bands of brown zigzag lines on the body-whorl. *Sculpture* consisting of a few close spiral threads upon the short neck. *Colour* yellowish-white, with fulvous zigzag markings on the lower half of the later spire-whorls and continued on the periphery of the body-whorl, a second similar spiral band upon the base. *Spire* rather short, conical, a little higher than the aperture; outlines faintly convex. *Protoconch* papillate. *Whorls* 5, regularly increasing, flatly convex, the last ventricose and rounded; base somewhat contracted. *Suture* not much impressed. *Aperture* narrow, angled above, not much narrowed below, and without a distinct canal. *Outer lip* straight above, rounded below, smooth inside. *Columella* subvertical, lightly turned to the left below. *Inner lip* very narrow and thin, smooth, spreading over the straight parietal wall. *Operculum* unknown.

Diameter, 2·4 mm.; height, 4·5 mm.

Animal unknown.

Type in my collection.

Hab.—New Zealand, exact locality unknown (E. A. Annett).

7. Mitrella subantarctica, Suter, 1908. Plate 19, fig. 19.

Mitrella subantarctica, Suter, P. Mal. S., viii, 1908, 180, pl. 7, f. 5.

Shell small, acuminate, smooth to the naked eye, polished, semi-transparent, fulvous. *Sculpture* consisting of fine and dense microscopic spiral striæ on all the whorls, lightly decussated by the fine and somewhat oblique growth-lines. *Colour* yellowish-brown, with a darker band below the suture, produced by the lower part of the preceding whorl. *Spire* high, conic, nearly $1\frac{1}{2}$ times the height of the aperture; outlines straight. *Protoconch* of $1\frac{1}{2}$ whorls, papillate. *Whorls* 6, regularly increasing, lightly convex, the last whorl rounded and a little contracted at the base. *Suture* impressed, but not deep. *Aperture* oval, subvertical, with a very short widely open canal. *Outer lip* sharp, not much thickened, convex, smooth inside, sometimes with a slight contraction below. *Columella* vertical, somewhat arcuate, bent to the left towards the base. *Inner lip* narrow, smooth, extending over the faintly excavated parietal wall. *Operculum* unknown.

Diameter, 2·7 mm.; height, 5·4–6 mm.

Animal unknown.

Type in my collection.

Hab.—Near the Bounty Islands, in 50 fathoms (Captain Bollons).

8. Mitrella Websteri, n. nov. Plate 19, fig. 20.

Columbella compta, Webst., T.N.Z.I., xxxviii, 1905 (1906), 308, pl. 38, f. 9.

Shell very small, elongated oval, spirally striate, thin, white. *Sculpture* consisting of numerous fine and close spiral cords with linear interstices, extending over the whole of the base, and crossed by fine growth-lines. *Colour* white. *Spire* conical, its height a little less than that of the aperture. *Protoconch* papillate, of $1\frac{1}{2}$ smooth and polished whorls. *Whorls* 4, regularly increasing, lightly convex; base somewhat contracted. *Suture* well impressed. *Aperture* elongate, narrow, sharply angled above, narrowed below, without a canal, base slightly notched. *Outer lip* thin and sharp, straightened above, smooth within. *Columella* vertical, straight. *Inner lip* almost obsolete, the spiral sculpture extending to the interior. *Operculum* unknown.

Diameter, 1 mm.; height, 3 mm. (type).

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms.

Remark.—The two specimens obtained in 110 fathoms are evidently not adult. Webster's specific name is preoccupied by Broun, 1832, and Lischke, 1873, and I therefore propose the above name.

Genus 2. Anachis, H. and A. Adams, 1853.

Anachis, H. & A. Ad., Ad. G.R.M., i, 1853, 184. Type: *Columbella rugosa*, Sowerby. *Seminella*, Pease, 1867. *Mitropsis*, Pease, 1867. *Costoanachis* and *Ecostoanachis*, Sacco, 1889.

Shell small, ovately fusiform, axially ribbed, the ribs getting sometimes obsolete on the last whorls, interstices with fine spiral cords; aperture narrow, the margins nearly parallel, with a rudimentary canal below; columella straight; outer lip nearly straight, with a posterior sinus, crenulated within.

The species are chiefly American and Polynesian in their distribution.

Two species occur in the Pliocene of New Zealand.

Key to Species.

A. Penultimate whorl with 3, body-whorl with 8 nodulous cinguli, reticulated by fine axial riblets; suture margined .. *nodicincta.*

B. Penultimate whorl with 6 to 7, body-whorl with 16 to 17 lightly granular cinguli, crossed by 16–18 axial riblets; suture simple .. .. *subabnormis.*

1. Anachis nodicincta, Suter, 1899. Plate 19, fig. 21.

Clathurella nodicincta, Sut., T.N.Z.I., xxxi, 1898 (1899), 74, pl. 3, f. 5; Index, 71. *Mangilia* (*Clathurella*) *nodocincta*, Sut., J. Mal., xii, 73.

Shell fusiform, turreted, solid, cream-coloured, clathrate. *Sculpture* consisting of strong elevated cinguli, 3 on the spire-whorls, 8 on the body-whorl, those on the periphery stronger than the others;

crossed and reticulated by equidistant fine and straight axial riblets, the spirals slightly nodulous at the points of intersection; between the riblets fine growth-lines. *Colour* cream-white or light brown. *Spire* conic, lightly scalar, somewhat higher than the aperture. *Protoconch* smooth, mamillary, of 2 convex whorls. *Whorls* 6½, regularly increasing, angled by the more elevated median spiral rib on the spire-whorls, the interstices between the spirals slightly concave; base somewhat contracted. *Suture* distinct, margined above by a fine thread. *Aperture* narrowly and elongately rhomboidal, angled above, with a short and broad canal below, its base slightly notched. *Outer lip* thickened, somewhat straight in the middle, faintly sinuated above, with 2 to 4 elongated denticles inside. *Columella* vertical, slightly turned to the left and twisted below, with 2 low and broad folds. *Inner lip* narrow and very thin; parietal wall with a rounded and low callus below the suture. *Operculum* unknown.

Diameter, 2·75 mm.; height, 6·5 mm.

Animal unknown.

Type in my collection.

Hab.—Lyall Bay, type (A. Hamilton); Titahi Bay (Miss Mestayer); Foveaux Strait.

2. Anachis subabnormis, Suter, 1899. Plate 19, fig. 22.

Clathurella subabnormis, Sut., T.N.Z.I., xxxi, 1898 (1899), 74, pl. 3, f. 4; Index, 71. *Mitromorpha subabnormis*, Sut.: Murdoch, T.N.Z.I., xxxvii, 1904 (1905), 230. *Columbella saxatilis*, Murdoch, *t.c.*, 225, pl. 8, f. 15.

Shell small, ovate-elongate, solid, sculptured with fine spiral and stronger axial riblets, brown. *Sculpture:* Axial ribs 16 to 18 on a whorl, low and rounded, equal to or a little less than the breadth of the interspaces, becoming obsolete upon the base and usually on approaching the outer lip; spiral riblets undulating, small but well marked, wider than the grooves, 6 or 7 on the penultimate and 16 to 17 on the last whorl; on crossing the costæ they have occasionally a somewhat granular appearance. *Colour* light or dark brown, usually a pale band around the periphery. *Spire* elevated conic, somewhat higher than the aperture with canal; outlines almost straight. *Protoconch* of 2 smooth polished and convex whorls, papillate. *Whorls* 6, regularly increasing, moderately convex; base very little contracted. *Suture* impressed. *Aperture* somewhat narrow, vertical, lightly channelled above, produced below into a widely open and very short canal, its base slightly notched. *Outer lip* vertical, thickened, with a few denticles inside near the middle. *Columella* vertical, straight, somewhat twisted below, with 2 or 3 small folds or tubercles. *Inner lip* narrow and thin, extending over the straight parietal wall. *Operculum* unknown.

Diameter, 2·7 mm.; height, 5·9 mm. (type).

Animal unknown.

Type in my collection; of *C. saxatilis*, in the Dominion Museum, Wellington.

Hab. — Takapuna, from sand in rock-pockets (R. Murdoch); Plimmerton, Cook Strait; Bay of Islands; Lyall Bay, type (A. Hamilton).

Genus 3. Alcira, H. Adams, 1860.

Alcira, H. Ad., P.Z.S., 1860, 450. Type: *A. elegans*, H. Adams.

Shell fusiform, thin, spire produced; whorls spirally striated or ribbed, rarely smooth; aperture ovate; columella truncate, with a single oblique fold anteriorly; outer lip thin, smooth internally, posteriorly expanded, and with the anterior margin sometimes crenulated.

The type is the only species recorded by Tryon, occurring at the Cape of Good Hope.

Fossil in the Pliocene of New Zealand.

Key to Species.

A. Height of spire equal to that of the aperture, or a little more.
  a. Surface smooth; outer lip a little thickened .. .. *lævigata.*
  aa. Surface sculptured.
    b. Penultimate whorl with 4–5, body-whorl with 12–14 cinguli, crossed by growth-lines; suture simple .. *sulcata.*
    bb. Penultimate whorl with 6–7, body-whorl with 16–20 cinguli, and low irregular axial riblets; suture margined .. .. *Suteri.*
B. Height of spire 1½ times that of the aperture.
  a. Whorls shouldered, spirally sharply ridged; suture bimarginate .. .. *angulata.*
  aa. Whorls flatly convex.
    b. Surface smooth; outer lip thick .. .. .. *sanguinea.*
    bb. Surface with spiral ribs; outer lip sharp .. .. *transitans.*
C. Height of spire twice that of the aperture. Surface smooth or with cinguli and deep grooves; suture canaliculate; outer lip inside with a few denticles .. .. *varians.*

1. **Alcira angulata**, Suter, 1908. Plate 19, fig. 23.

Alcira angulata, Suter, P. Mal. S., viii, 1908, 181, pl. 7, f. 9.

Shell small, elongate-fusiform, turreted, spirally ribbed, fulvous. *Sculpture:* The protoconch smooth, all the succeeding whorls sharply spirally ridged; 2 fine spiral threads on the shoulder, the upper close to the suture, a third strong spiral cord upon the angle of the whorls, and 3 smaller ones below, the lowest fine and margining the suture; the spiral ornamentation is continued over the whole of the body-whorl, the spirals on the base being closer together; interstices above the base slightly broader than the cinguli, with fine growth-lines. *Colour* yellowish-brown, the base lighter. *Spire* elevated, conic, turriculate, about 1½ times the height of the aperture. *Protoconch* conical, smooth, of 2 whorls, the nucleus small, the second whorl relatively high. *Whorls* 6½, regularly increasing, distinctly shouldered, lightly

convex below the angle; body-whorl high, moderately convex, contracted below. *Suture* linear, bimarginate. *Aperture* narrow, subrhomboidal, the margins parallel, angled above, with a very short and broad canal below. *Outer lip* vertical at the middle, lirate within, the lirae corresponding to grooves on the outside, edge sharp. *Columella* straight above, forming a blunt angle with the parietal wall, slightly turned to the left below, smooth, twisted and with a distinct fold at the base. *Inner lip* narrow and thin. *Operculum* unknown.

Diameter, 3 mm.; height, 7·1 mm.

Animal unknown.

Type in my collection.

Hab.—Foveaux Strait.

2. Alcira lævigata, Suter, 1908. Plate 19, fig. 24.

Alcira lævigata, Suter, P. Mal. S., viii, 1908, 181, pl. 7, f. 8.

Shell small, thin, translucent, elongately oval, smooth, faintly shining, white. *Sculpture* confined to a few oblique ridges on the lower part of the base. *Colour* yellowish-white, sometimes faintly marbled with pure-white. *Spire* elevated conic, about the same height as the aperture; outlines almost straight. *Protoconch* of 1½ smooth porcellanous and polished whorls, the nucleus a little oblique. *Whorls* 5, regularly increasing, lightly convex, the last rounded and contracted at the base. *Suture* deep. *Aperture* subvertical, high and narrow, lightly channelled above, and with a very short widely open canal below. *Outer lip* lightly curved, sharp, but little thickened. *Columella* vertical, with a deep-seated oblique fold at the base. *Inner lip* very narrow and thin, extending over the flattish parietal wall. *Operculum* unknown.

Diameter, 1·8 mm.; height, 4·1 mm.

Animal unknown.

Type in my collection.

Hab.—Five miles south of Cuvier Island, in 38 fathoms, type (Captain Bollons); off Great Barrier Island, in 110 fathoms.

3. Alcira sanguinea, Suter, 1908. Plate 19, fig. 25.

Alcira sanguinea, Suter, P. Mal. S., viii, 1908, 181, pl. 7, f. 7.

Shell small, elongately ovate, smooth, not shining, crimson. There is no *sculpture* except the fine growth-lines. *Colour* crimson; dead shells are pinkish. *Spire* high, conic, about 1½ times the height of the aperture; outlines straight. *Protoconch* sometimes slightly oblique, of 1½ smooth whorls, papillate. *Whorls* 6, regularly increasing, flattish, the last rather large, rounded and contracted at the base. *Suture* impressed. *Aperture* vertical, narrowly ovate, lightly channelled above, with a short and widely open canal below. *Outer lip* thick, with a blunt edge, smooth inside, almost straight above, curved below.

Columella vertical, arcuate, with a distinct oblique fold below, bending to the left. *Inner lip* narrow and very thin, smooth. *Operculum* unknown.

Diameter, 2·7 mm. ; height, 6·2 mm.

Animal unknown.

Type in my collection.

Hab.—Near the Bounty Islands, in 50 fathoms (Captain Bollons).

4. Alcira sulcata, Hutton, 1873. Plate 20, fig. 1.

Lachesis sulcata, Hutton, C.M.M., 12 ; J. de Conch., 1878, 17 ; M.N.Z.M., 45. *Columbella Huttoni*, Suter, Index, 72 ; Murdoch, T.N.Z.I., xxxvii, 223, pl. 7, f. 12.

Shell small, robust, broadly subulate, spirally distinctly ribbed, light brown. *Sculpture* consisting of broad flatly rounded and prominent spiral ribs, 4 to 5 on the penultimate and 12 to 14 on the last whorl, they are subequal on the spire-whorls, minute and close together on the neck of the canal ; the interstices are slightly narrower than the ribs, and rather deep ; both are crossed by irregular growth-lines, which give the shell a slightly roughish appearance. *Colour* ash-grey, brown, or reddish-brown, sometimes variegated with white. *Spire* elevated conical, usually very little higher than the aperture with canal ; outlines straight. *Protoconch* papillate, of 2 smooth convex whorls, reddish-brown. *Whorls* 6, regularly increasing, flatly convex ; base contracted above the neck of the canal. *Suture* impressed. *Aperture* oval, somewhat channelled above, produced below into a widely open oblique and short canal, its base lightly notched. *Outer lip* convex, contracted below, crenated by spiral sculpture. *Columella* somewhat arcuate, the spirals usually continued over the outer part of it, with a deep-situated but mostly distinct oblique plait at the base. *Inner lip* mostly inconspicuous. *Operculum* unknown.

Diameter, 3·75 mm. ; height, 9 mm. (type). Diameter, 2·5 mm. ; height, 6 mm. (specimen from Whangaroa).

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Stewart Island (type) ; Whangaroa Harbour (C. Traill).

5. Alcira Suteri, Murdoch, 1905. Plate 20, fig. 2.

Mitromorpha Suteri, Murd., T.N.Z.I., xxxvii, 1904 (1905), 220, pl. 7, f. 6.

Shell small, elongately oval, somewhat thin, with fine spiral and usually somewhat obsolete longitudinal riblets. *Sculpture:* The penultimate whorl with 6 to 7 and the last with 16 to 20 spiral riblets, 7 or 8 of which are in front of the aperture ; they are slightly variable in strength, some in breadth equal to the interspaces, others are narrower ; also an occasional small thread here and there arises in the

interspaces; axial riblets irregular, low and rounded, more distinct on the spire, often obsolete, they are frequently cutting up the spirals into minute gemmules. *Colour* light reddish-brown, sometimes a pale band around the periphery, occasionally a darker narrow band at the suture. *Spire* conical, a little higher than the aperture. *Protoconch* of 2 whorls, somewhat globose, smooth and polished, the nucleus oblique to the succeeding whorl. *Whorls* 5, lightly rounded, a little contracted at the base. *Suture* impressed, usually margined with a wider riblet. *Aperture* narrow, oblique, angled above, broadly truncated at the base. *Outer lip* thin, a little flattened, broadly sinuate above, thickened at the middle. *Columella* almost straight, concave, smooth, twisted and with a slight fold below. *Inner lip* thin and narrow. *Operculum* unknown.

Diameter, 1·7 mm.; height, 4·6 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Whangaroa Harbour, type (C. Traill).

6. Alcira transitans, Murdoch, 1905. Plate 20, fig. 3.

Columbella transitans, Murd., T.N.Z.I., xxxvii, 1904 (1905), 224, pl. 7, f. 13.

Shell small, subulate, somewhat shining, spirally lirate, brown. *Sculpture* consisting of close and numerous subequal spiral riblets, the interstices narrow and not very deep, 5 to 8 on the penultimate and 15 to 20 on the last whorl, occasionally one or two riblets at the periphery of the body-whorl are broader than the others; the whole crossed by irregular fine growth-lines. *Colour* light or dark brown, olive, or reddish-brown, sometimes with a lighter band immediately below the suture and produced around the periphery of the last whorl, but occasionally this band is darker than the ground-colour. *Spire* high, subulate, about $1\frac{1}{2}$ times the height of the aperture; outlines straight. *Protoconch* of $2\frac{1}{2}$ whorls, smooth and shining, the nucleus globose. *Whorls* 6, regularly increasing, flattened; base very little contracted, *Suture* impressed. *Aperture* oval, acutely angled or subchannelled above, slightly narrowed below, without a canal, base lightly notched. *Outer lip* simple, uniformly curved, sharp. *Columella* vertical, very little excavated, smooth, with a basal plait. *Inner lip* very narrow and thin, extending over the straight parietal wall. *Operculum* unknown.

Diameter, 2·2 mm.; height, 5·1 mm. (type).

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Whangaroa Harbour, type (C. Traill); Stewart Island; Bounty and Snares Islands, in 50 fathoms (Captain Bollons); Auckland Islands (Professor W. B. Benham); Campbell Island (Professor C. Chilton).

Fossil in the Pliocene.

7. Alcira varians, Hutton, 1885. Plate 20, fig. 4.

Columbella varians, Hutton, T.N.Z.I., xvii, 1885, 314, pl. 18, f. 2; Plioc. M., 44, pl. 6, f. 16; not of Sowerby, 1832. *Surcula varians*, Hutt.: Suter, T.N.Z.I., xxxi, 69; Index, 71. *Columbella inconstans*, Suter, T.N.Z.I., xxxviii, 1905 (1906), 329.

Shell small, oblong, solid, spirally grooved or smooth, light brown. *Sculpture:* The whole shell is either smooth, with a few spiral grooves on the neck of the canal only, or distantly spirally ribbed, the ribs very unequal in number and width; on the penultimate whorl they vary from 2 to 5, and their number may be up to 15 on the body-whorl; the ribs are flat, usually broad on the spire-whorls, but narrow on the base; the interstices are mostly much narrower than the riblets; the fine growth-lines are distinct only in the moderately deep grooves. *Colour* light or darker fulvous. *Spire* elevated conic, nearly twice the height of the aperture, outlines straight, sometimes slightly scalar. *Protoconch* small, papillate, of 2 smooth whorls, dark brown and polished. *Whorls* 7, regularly increasing, periphery of body-whorl convex; base somewhat contracted. *Suture* canaliculate. *Aperture* vertical, oval and narrow, lightly channelled above, produced below into a short open and slightly oblique canal, its base moderately notched. *Outer lip* flatly convex, thickened, with a few small teeth within, the uppermost larger than the others. *Columella* vertical, straight, and smooth, with an oblique spiral fold at its base, distinctly visible on looking up through the canal. *Inner lip* narrow and thin, spreading over the straight parietal wall. *Operculum* unknown.

Diameter, 3·75 mm.; height, 9·5 mm. (type, from the Pliocene).

Animal unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—Foveaux Strait, in 15 fathoms; dredged in Dunedin Harbour (A. Hamilton); Auckland Islands (Professor W. B. Benham); Snares, in 50 fathoms (Captain Bollons).

Fossil in the Pliocene.

Genus 4. Atilia. H. and A. Adams, 1853.

Atilia, H. & A. Ad., Ad. G.R.M., i, 1853, 184. Type: *Mitrella minor*, Scacchi. *Columbellopsis*, Bucq., Dollf., & Dautzenb., 1882. *Tetrastomella*, Bell, 1889. *Clinurella*, Sacco, 1889 (in part).

Shell small, fusiform; spire elevated, acute; whorls smooth or longitudinally plicate; aperture small, subrhomboidal, lightly channelled above, contracted below, and ending in a distinct short canal; outer lip generally thickened and varicose on the outside, crenate within; columella straight, sometimes plicate below.

Distribution chiefly in the Pacific.

Fossil in the Tertiary.

KEY TO SPECIES.

A. Shell biconic, smooth, a few oblique striæ on the base; suture false-margined; outer lip smooth inside .. .. .. *biconica.*
B. Shell fusiform, second whorl and base with fine spiral striæ; suture simple; outer lip with faint denticles inside .. .. *dæmona.*

1. Atilia biconica, Suter, 1908. Plate 20, fig. 5.

Atilia biconica, Suter, P. Mal. S., viii, 1908, 182, pl. 7, f. 10.

Shell small, biconic, very thin, translucent, not shining, yellowish-white, with a distinct canal. *Sculpture* consisting of oblique spiral threads upon the neck; the growth-lines are microscopic, fine, and dense. *Colour* yellowish-white, with a few light-brown zigzag markings. *Spire* elevated conic, of about the same height as the aperture with canal; outlines straight. *Protoconch* papillate, of 1½ smooth whorls. *Whorls* 5, regularly increasing, flattish, the last well rounded at the periphery, considerably contracted below. *Suture* impressed, very distinctly false-margined below. *Aperture* high and narrow, oblique, angled above, produced below into a straight short and widely open canal, truncated at its base. *Outer lip* distinctly convex at the middle, contracted below, thin and sharp. *Columella* subvertical, lightly convex in the middle, the spirals of the neck passing over it. *Inner lip* obsolete. *Operculum* unknown.

Diameter, 2·1 mm.; height, 4·7 mm.

Animal unknown.

Type in my collection.

Hab.—Hauraki Gulf, in 25 fathoms.

Remark.—The two specimens at my disposal for drawing up the above diagnosis do not appear to be quite full grown.

2. Atilia dæmona, Webster, 1906. Plate 20, fig. 6.

Columbella dæmona, Webst., T.N.Z.I., xxxviii, 1905 (1906), 308, pl. 38, f. 8.

Shell small, fragile, fusiform, smooth, with rufous markings. *Sculpture:* The second whorl finely axially striated, lower part of the base with about 15 obscure spiral striations; the whole shell with fine growth-striæ. *Colour* pale cream, dull, with rufous zigzag markings. *Spire* narrowly conic, of the same height as the aperture; outlines almost straight. *Protoconch* papillate, the nucleus smooth. *Whorls* 5, regularly increasing, slightly convex; base flatly contracted. *Suture* impressed. *Aperture* subvertical, high and narrow, sharply angled above, narrowed below, with a distinct open canal. *Outer lip* lightly arched, thin and sharp, with numerous faint denticles inside. *Columella* vertical, slightly arched, smooth. *Inner lip* narrow and thin, produced over the faintly convex parietal wall. *Operculum* unknown.

Diameter, 2 mm.; height, 6 mm. (type).

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms.

Fam. **VOLUTIDÆ**, Gray.

Animal having a broad foot, the head very flattened, and transversely widened, with the eyes on the sides, the tentacles distant; siphon with internal appendages. Formula of radula usually 0+1+0, exceptionally 1+1+1.

Shell usually large, elongated, more or less oval; spire relatively short; protoconch smooth, very variable, sometimes small and conoidal, or large and bulbose, with the nucleus very little elevated, but occasionally distinctly mucronate; aperture elongated, sometimes widened, truncated and often deeply excavated below; outer lip generally thick, more or less straight; columella callous, obliquely twisted below, and ending in a point usually lower than the extremity of the opposite lip; the plaits extremely variable, mostly numbering 3 to 5, very oblique, thin and unequal, or thick, subtransverse, and nearly equal; inner lip more or less thick, usually spreading over the base. An operculum is but rarely present.

The majority of the members of this family belong to the Southern Hemisphere; most of them live in the littoral and laminarian zones, but specimens have been obtained in much greater depths (1,600 fathoms).

Fossil.—The *Volutidæ* first appear in the Cretaceous.

Genus 1. Fulguraria, Schumacher, 1817.

Fulguraria, Schumacher, Essai Nouv. Syst., 1817, 242. Type: *Voluta rupestris*, Gmelin.

Shell large, usually narrowly elongate; protoconch bulbose, often very large, the nucleus rolled up laterally and rounded; aperture more or less widened, lightly notched at the base; outer lip not reflexed; columellar plaits variable in number, moderately oblique.

Subgen. 1. Alcithoe, H. and A. Adams, 1858.

Alcithoe, H. & A. Ad., Ad. G.R.M., i, 164; ii, 617. Type: *Voluta pacifica*, Solander (= *arabica*, Martyn).

Shell large, ovately fusiform; spire produced, conic; protoconch bulbose, larger than the succeeding whorl, sometimes costulate; the body-whorl large, somewhat swollen at the middle, attenuated and excavated at the base; fasciole not elevated; aperture oval-elongated, with a canaliculate channel above, but little narrowed below, broadly truncated and excavated; outer lip dilated, subreflexed, nearly vertical, smooth inside, retrocurrent towards the suture; columella almost straight, with 3 to 7 equidistant, thick, and oblique plaits, lightly recurved below, and ending in a pointed beak; inner lip thin, spreading broadly over the body-whorl. No operculum.

The subgenus is distributed over the coasts of New Zealand, Tasmania, Australia, New Caledonia, South America, Japan, and East Africa.

Fossil in the Tertiary.

KEY TO SPECIES.

A. Height of spire about half that of the aperture.
   a. Last whorl with 7 to 10 prominent nodules on the angle of the shoulder .. .. *arabica.*
   aa. Whorls scarcely shouldered, nodules obsolete .. .. *elongata.*
B. Height of spire about one-third that of the aperture; whorls shouldered, last whorl with 8 to 10 nodules; columella with 5 to 7 plaits .. .. *depressa.*
C. Height of spire about two-thirds that of the aperture.
   a. Whorls axially lightly costate, with 10 small nodules on the last whorl, which is lightly shouldered or convex; angle of spire, 36–40° .. .. *gracilis.*
   aa. Whorls with 10 distinct axial ribs, absent on the greater part of the body-whorl, which is distinctly shouldered; angle of spire, 32° .. .. *Hedleyi.*
   aaa. Whorls with light axial ribs, no nodules on the convex body-whorl; angle of spire, 42° .. .. *lutea.*

1. Fulguraria arabica, Martyn, 1784. Plate 48, fig. 5.

Buccinum arabicum, Mart., Un. Conch., ii, f. 52. *Voluta arabica*, Gmelin, Syst. Nat., ed. xiii, 1790, 3461; Dieff. N.Z. 235. *Scaphella arabica*, Mart.: Hedley, Colon. Mus. Bull., No. 1, 1906, 49. *Voluta pacifica*, Chemnitz, Conch. Cab., xi, 1795, 1713–14; Voy. Astrol., ii, 1832, 625, pl. 44, f. 6; Conch. Icon., vi, Voluta, pl. 17, f. 38; Chenu, Man. de Conch., i, 191, f. 971; Hutton, C.M.M., 18; M.N.Z.M., 61; T.N.Z.I., xvi, 225; Sowerby, Thes. Conch., i, pl. 48, f. 26; Hombr. & Jacq., Voy. P.S., v, 72, pl. 19, f. 7; Tryon, Man. Conch. (1), iv, 94, pl. 28, f. 97. *Cymbiola pacifica*, Swainson, Exot. Conch., ed. Hanley, 1841, 18, pl. 14, 43. *Scapha pacifica*, Gray, P.Z.S., 1855, 58. *Scaphella pacifica*, Lam.: Harris, C. Tert. M.B.M., i, 113; Index, 74.

Shell large, elongate, fusiform, solid, fulvous with dark zigzag markings, the upper whorls costate, the lower two or three with a row of nodules. *Sculpture:* The protoconch is smooth, the following 3 are axially costate, the costæ are slightly oblique, equidistant, rounded, very low above the periphery of the whorls, the last two or three whorls with a more or less distinct row of tubercles on the keel of the shoulder, 7 to 10 in number; they are either high and sharply rounded, laterally compressed, or only low rounded nodules; occasionally the lower whorls are quite smooth. *Colour* yellowish-white or fulvous, with dark-brown or blackish, angular, flexuous, anastomosing, transverse markings, which, being thicker and darker in certain places, form 3 or 4 more or less distinct spiral bands on the body-whorl; sometimes entirely covered with a dark reddish-brown coating. *Spire* high, more or less turreted, conic, its height about equal to half the height of the aperture. *Protoconch* moderately large, of $2\frac{1}{2}$ bulbose smooth whorls, the nucleus somewhat lateral. *Whorls* about 7, first slowly then rapidly increasing, the lower ones more or less prominently

shouldered, the shoulder flat or very lightly concave; body-whorl lightly inflated at the middle, very little contracted below. *Suture* not deep, somewhat undulating. *Aperture* high, narrowly ovate, lightly channelled and canaliculate above, but little narrowed and deeply notched below. *Outer lip* somewhat thickened, rounded and a little reflected outwardly, smooth, vertical, sometimes a little sinuate at the middle, strongly retrocurrent towards the suture. *Columella* subvertical, usually with 5 strong and nearly equidistant oblique plaits, the lowest extending to the sharp beak below; sometimes 1, 2, or 3 smaller folds are intercalated between the stronger ones, or the number of plaits may be reduced to 4 only. *Inner lip* thin, spreading broadly over the body-whorl, with a rounded free edge on the left side, and separated by a groove from the broad lamellate and flat fasciole, which may be bounded towards base by a narrow keel.

Diameter, 50 mm.; height, 126 mm.; angle of spire, 40–48°. Diameter, 46 mm.; height, 117 mm. Diameter, 46 mm.; height, 98 mm.

Animal having a large foot, squarish in front, not extending beyond the spire; head broadly rounded, with 2 short tentacles, the eyes situated at some distance outside their bases. Siphon not very long. Colour wine-purple, dusted with yellow; hood bordered with reddish.

Dentition (Hutton, T.N.Z.I., xv, 121, pl. 13, f. U).—Formula 0 + 1 + 0; central tooth arched, with 3 large subequal triangular cusps, occupying the whole of the posterior margin.

Type lost.

Hab.—North and South Islands, mostly on sandy beaches, burrowing in the sand near low-water mark; in about 15 fathoms in Foveaux Strait; Kermadec Islands (Captain Bollons). Brought to England by Captain Cook. Solander states that he picked up a specimen on Endeavour Reef, north-east coast of Australia.

Fossil in the Miocene and Pliocene.

Maori.—Puhauriroa (*fide* Captain Bollons).

Subsp. **elongata**, Swainson, 1821. Plate 48, fig. 6.

Voluta elongata, Swains., Exot. Conch., 1821, pl. 20, 21. *Scaphella elongata*, Swains., Exot. Conch., ed. Hanley, 23, pl. 20, 21. *Voluta pacifica*, var. *elongata*, Swains., M.N.Z.M., 62; T.N.Z.I., xvi, 225. *Scaphella pacifica*, var. *elongata*, Swains., Index, 74.

Distinguished from the species by its more elongate form, the convex, not shouldered whorls, and the almost total absence of nodules. *Sculpture* consisting of broadly rounded and low axial costæ on the three whorls below the protoconch, sometimes obsolete; the lower whorls are irregularly axially plaited, the plaits sometimes prominent and flatly convex, the whole shell ornamented with fine growth-lines. *Colour* the same as in the species. *Spire* usually somewhat higher than half the height of the aperture. *Whorls* moderately convex,

the body-whorl but moderately ventricose. *Suture* compressed and wrinkled. *Outer lip* as in the species. *Columella* with 4 to 6 plaits, 5 being the usual number.

Diameter, 51 mm.; height, 147 mm. (type). Diameter, 60 mm.; height, 170 mm. (large specimen, 7 whorls). Diameter, 42 mm.; height, 93 mm. (small specimen, 6 whorls).

Hab.—Found together with the species, but it is a much rarer shell. Also found at the Kermadec Islands. The type is from the Bay of Islands.

Fossil in the Pliocene, Miocene, and Oligocene.

2. Fulguraria depressa, Suter, 1908. Plate 48, fig. 7.

Fulguraria (*Alcithoe*) *depressa*, Suter, P. Mal. S., viii, 1908, 182, pl. 7, f. 11.

Shell moderately large, ovate, solid, with a short spire and large aperture, the last two or three whorls with nodules on the angle of the shoulder, with a few brown zigzag lines. *Sculpture:* The penultimate whorl with a row of distant roundish nodules above the suture, the body-whorl with a row of elongated prominent nodules on the angle of the shoulder, their number being about 8 to 10. *Colour* yellowish-white, with a few longitudinal fulvous zigzag bands, indistinctly arranged into 3 spiral bands on the body-whorl and a fourth above the fasciole, outer lip with a few brown spots. *Spire* low, conoidal, its height about one-third that of the aperture. *Protoconch* much worn and the nucleus lost. *Whorls* about 7, the last very large, the upper whorls lightly convex, the last two broadly shouldered, the slope flattish, body-whorl flatly convex at the periphery and somewhat contracted below; the fasciole broad, hardly raised, flattish. *Suture* distinct, but not deep. *Aperture* high, triangular, narrow above, widened below, with a narrow upper channel, very broadly truncated and rather deeply notched at the base. *Outer lip* oblique, its upper part nearly straight, the lower moderately curved, much thickened, rounded, smooth, but not reflected, retrocurrent towards the suture. *Columella* subvertical, straight, with 5 to 6 somewhat inequidistant subequal strong and flat plaits, sometimes with an additional small plait above; the columella slightly twisted below and produced into a narrowly rounded beak, extending beyond the inferior end of the outer lip. *Inner lip* thin, spreading broadly over the body and the lightly convex wall, with a roundly raised outer edge below.

Diameter, 41 mm.; height, 80 mm. Angle of spire, 50°.

Animal unknown.

Type in my collection.

Hab.—Spirits Bay, North Island (C. Cooper, Captain Bollons).

Remarks.—Only empty shells have hitherto been available, and the description is therefore somewhat imperfect. The species was discovered near Spirits Bay by Mr. C. Cooper, of Auckland, and later on also collected by Captain Bollons.

3. Fulguraria gracilis, Swainson, 1821. Plate 48, fig. 8.

Voluta gracilis, Swains., Exot. Conch., 1821, 20, pl. 42. *Cymbiola gracilis*, Swains., Exot. Conch., ed. Hanley, 20, pl. 42. *Voluta gracilis*, Reeve, Conch. Icon., vi, pl. 17, f. 40. *Voluta pacifica*, var. *gracilis*, Swains., C.M.M., 18; Man. Conch. (1), iv, 94, pl. 28, f. 99. *V. gracilis*, Swains., N.M.Z.M.,62; Chall. Rep., xv, 258. *Scaphella gracilis*, Swains.: Harris, C. Tert. M.B.M., i, 114. *Voluta fusus*, Q. & G., Voy. Astrol., ii, 1832, 627, pl. 44, f. 7, 8. *V. subplicata*, Hutton, C.M.M., 18. *Scaphella gracilis*, Swains., Index, 74. *Fulguraria* (*Alcithoe*) *gracilis*, Swains.: Murdoch and Suter, T.N.Z.I., xxxviii, 288.

Shell small, fusiform, nodosely plicate, solid, with brown zigzag markings. *Sculpture:* The protoconch is smooth; all succeeding spire-whorls are axially plicate-costate, the costæ more prominent on the lower half of the whorls; on the body-whorl the costæ, 10 in number, appear upon the slight angle of the whorl, and are continued a short distance towards the base, or they are only forming a row of elongated nodules. *Colour* light fulvous, variegated by numerous longitudinally waved chestnut lines, so close as almost to form a network over the entire surface, but very often arranged in 3 spiral bands on the body-whorl. *Spire* not very high, conic, slightly turreted, its height about two-thirds the height of the aperture. *Protoconch* bulbose, of 2 smooth and convex whorls, the nucleus slightly lateral. *Whorls* 6, the last high, lightly shouldered or convex; base very little contracted. *Suture* distinct, but not deep. *Aperture* elongate, rather narrow, narrowly channelled above, truncated and slightly notched at the base. *Outer lip* thickened and not reflected, smooth, lightly convex above, arched below. *Columella* straight, subvertical, produced below into a sharply pointed beak, with 4 oblique subequidistant plaits. *Inner lip* thin, broadly spread over the body-whorl and to the slightly elevated fasciole at the base.

Diameter, 23 mm.; height, 55 mm. (almost typical). Diameter, 17 mm.; height, 46 mm. (*Voluta fusus*, Q. & G.). Angle of spire, 36–40°.

Animal yellow, finely dotted with red-brown.

Dentition unknown.

Hab.—Bay of Islands; off Great Barrier Island, in 110 fathoms; along the Manawatu coast, thrown up after gales; Queen Charlotte Sound, in 10 fathoms ("Challenger" Exped.).

Remark.—The species is living in deep water, and apparently is not so common as *F. arabica*.

Maori.—Kaou (*fide* Quoy and Gaimard).

Fossil in the Miocene and Pliocene.

4. Fulguraria Hedleyi, Murdoch and Suter, 1906. Plate 20, fig. 7.

Fulguraria (*Alcithoe*) *Hedleyi*, M. & S., T.N.Z.I., xxxviii, 1905 (1906), 288, pl. 23, f. 20, 21.

Shell elongato-fusiform, spire rather long, acuminate, costate; body-whorl smooth, with fine longitudinal zigzag markings; columella

with 4 plaits. *Sculpture:* The protoconch has 1 or 2 spiral threads; the following whorls of the spire are distantly axially costate, the costæ extending over the lower two-thirds of each whorl, 10 on a volution; a few costæ are situated on the body above the aperture, but the remainder is smooth; growth-lines are visible on all the whorls, more distinct and close together on the last whorl; with a lens a number of spiral lines may be distinguished below the shoulder of the whorls. *Colour:* No live specimens having been obtained, it is impossible to guess the colour of the shell, which is most likely light fulvous; fine longitudinal brown zigzag lines ornament all the whorls, except the protoconch. The *spire* is much shorter than the aperture, conical, acuminate but obtuse. *Protoconch* consists of 2 slightly bulbose whorls; the nucleus is slightly lateral, smooth; the second whorl has one or two spiral threads. *Whorls* 7, shouldered, first slowly then rapidly increasing in height. *Suture* distinct, but not impressed, retrocurrent on reaching the aperture. *Aperture* high and narrow, slightly canaliculated at the upper angle, very little narrowed at the base, where it is broadly truncated and sinuated. *Outer lip* forming a very light curve, nearly straight, thickened and rounded above, thinner near the base, smooth, not expanded. *Columella* very slightly excavated near the middle, with 4 almost equidistant and very oblique strong plaits, all of nearly equal size, narrowed below into a sharply rounded beak, which extends beyond the basal margin of the outer lip. *Inner lip* thin, shining, broadly expanded on the body, and with a few longitudinal striæ, narrower upon the pillar.

Diameter, 18 mm.; height, 61 mm. (type). Angle of spire, 32°.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms (type); four miles west of Cuvier Island, in 44 fathoms (Captain Bollons).

5. **Fulguraria lutea**, Watson, 1882. Plate 20, fig. 8.

Cymbiola lutea, Watson, J.L.S., xvi, 1882, 331. *Voluta (Cymbiola) lutea*, Wats., Chall. Rep., xv, 1886, 255, pl. 15, f. 3; T.N.Z.I., xvi, 225. *Scaphella lutea*, Wats., Index, 74.

Shell fusiform, strongish, pale buff, with high blunt spire, largish aperture, slightly reverted outer lip, and 4 teeth on the pillar. *Sculpture:* On the upper whorls there are a few slight narrow axial ribs, which are almost obsolete on the later whorls; the lines of growth are many and hair-like. The columellar swelling in front is very small and slight. *Colour* ashy-white over pale buff, entirely without gloss, the outer lip and the body-glaze are rich buff, paler inwards. *Spire* high, a little irregularly bent, subscalar, its height two-thirds of that of the aperture. *Protoconch* blunt, mamillary, impressed. *Whorls* $6\frac{3}{4}$; they are convex, above contracted into the suture, perpendicular below; after the first three they increase rapidly; the

last is slightly ventricose. long, attenuated in front. *Suture* oblique, slightly impressed, irregular. *Aperture* long, but not wide, oblique, with its two sides nearly parallel, bluntly pointed above, ending below in a broad, shallow, slightly emarginated, minutely bordered canal. *Outer lip* patulous, thin, but expanded and rounded at the edge; it rises on the penultimate whorl at its junction, and is here drawn back into a slight sinus with a very reverted edge. *Columella* perpendicular, with 4 not strong, equal, concealed, pale-coloured, very oblique plaits; obliquely cut off, twisted and rounded in front into a prominent thin point. *Inner lip* spreading widely as a thin glaze on the body. (Watson.)

Diameter, 31·6 mm.; height, 70 mm. Angle of spire, 42°.

Animal unknown.

Type in the British Museum.

Hab.—Two hundred miles west of Cape Farewell, in 275 fathoms.

Remark.—The form of the shell, the mamillary protoconch with rounded nucleus, and the number of plaits remove it from *Cymbiola*.

Fam. **OLIVIDÆ**, d'Orbigny.

Animal having the foot divided anteriorly by a transverse groove and the fore part extended beyond the head; eyes, when present, on the middle of the tentacles; a posterior pallial tentacle. Lobes of the foot usually reflexed over the sides of the shell; siphon recurved. The radula has the formula 1+1+1; the central tooth transverse, multicuspidate, laterals unicuspidate, triangular or unciform.

Shell smooth, polished, porcellanous, without epidermis, subcylindrical or subfusiform; aperture oblong, notched at the base; columellar lip, sutures, and spire more or less covered with a callous deposit. Operculum present or absent.

The animals are mostly burrowing in sand.

Fossil from the Cretaceous.

Genus 1. Ancilla, Lamarck, 1799.

Ancilla, Lam., Mém. Soc. Hist. Nat. Paris, 1799, 70. Type: *A. cinnamomea*, Lam. *Ancillaria*, Lam., 1811. *Ancillus*, Montfort, 1810. *Anaulax*, Roissy, 1805. *Amalda*, H. and A. Adams, 1853. *Sparella*, Gray, 1857. *Sandella*, Gray, 1857.

Animal having an elongated foot, bifurcate posteriorly, the lateral lobes reflexed over the shell; the anterior part of the foot (propodium) triangular, with a median longitudinal groove above; tentacles small, without eyes; siphon elongated. Central tooth of radula with 3 well-developed cusps and a few intermediate small denticles.

Shell oblong, occasionally acuminate, smooth and polished; suture sometimes canaliculate, but more frequently covered over by callus, sometimes completely hiding the spire; columella excavated, twisted, and carrying several plications towards the base, which are not hidden

by callous growth, whereas the upper portion of the columella is thick, callous, or gibbose. A depression or groove usually separates the callosity of the spire from what is commonly called the "smooth zone," though this zone is often not as smooth as the callous spire, especially when strongly exhibiting the lines of growth; the relative size of this zone is of specific value taken in conjunction with cognate characters. Aperture grooved above, and truncate and deeply sinuous below. Operculum horny, elongate-oval, obtuse at both ends, the nucleus subapical.

Distribution.—About fifty species are known, inhabiting tropical and warm seas—Red Sea, Indian Ocean, Japan, Australasia, Polynesia, Africa, &c.

The earliest fossils are from the Cretaceous and Eocene.

KEY TO SPECIES.

a. Spire with a very thick callosity, its height about two-thirds that of the aperture; apex blunt; body-whorl bluish to dark brown, banded with white and brown; 19 mm. by 34 mm. to 22 mm. by 44 mm. .. .. .. *australis.*

b. Similar to *A. australis*, but the callosity on the spire moderate, apex sharply pointed .. .. *pyramidalis.*

c. Shell small, narrowly ovate, spire with a thin callus, about half the height of the aperture; body-whorl fawn, banded with white and brown; $4\frac{1}{4}$ mm. by $9\frac{1}{2}$ mm. .. .. .. *bicolor.*

d. Similar to *A. pyramidalis*, but the body-whorl broadened above and flattish on the ventral side; $8\frac{1}{2}$ mm. by 15 mm. to 23 mm. by 42 mm. .. .. *depressa.*

e. Shell elongated oblong; spire very callous, its height more than half that of the aperture; apex mucronate; body-whorl fawn colour, banded with white and light brown; 11 mm. by 22 mm. to 21 mm. by 45 mm. .. .. *mucronata.*

1. Ancilla australis, Sowerby, 1830. Plate, 49, fig. 1.

Ancillaria australis, Sow., Spec. Conchyl., 1830, 7, f. 44–46; Voy. Astrol., iii, 20, pl. 49, f. 13–17; Thes. Conch., iii, 63, pl. 211, f. 1, 2; Conch. Icon., xv, pl. 3, f. 7; M.N.Z.M., 58; T.N.Z.I., xvi, 223; Harris, C. Tert. M.B.M., i, 76; Man. Conch. (1), v, 94, pl. 38, f. 28. *A. rubiginosa*, Swains.: Suter, T.N.Z.I., xxxviii, 332; not of Swainson.

Shell elongately oval, with a short spire, covered by a thick callosity; leaden-blue and brown. *Sculpture* consisting of fine vertical growth-lines, crossed by very fine dense spiral striæ, sometimes distinct axial plications appear on the last whorl on approaching the aperture; base with an oblique narrow light depression above the slightly raised fasciole, which is somewhat excavated in the middle and more or less angularly plicated. *Colour:* Spire yellow or reddish-brown, followed by a broad chestnut spiral band, margined with white below; the centre of the body-whorl is bluish to dark brown, vertically lined with white or bluish; the basal narrow groove is bluish-brown, margined above and below with white; the fasciole consists of three parts, the upper lightly elevated and the median depressed parts are

usually of the same light-brown colour, but the lowest third part, which is distinctly marked off from the others, is white, sometimes tinged with yellowish ; inner lip purplish to white ; aperture brownish-purple inside. *Spire* short, the apex blunt or mucronate, conic, its height about two-thirds that of the aperture ; outlines lightly convex, straight, or concave ; the whole spire covered over by callus, which is minutely granulated, and forms a more or less thick pad on the ventral side, extending to the apex. *Protoconch* mostly hidden by enamel, but sometimes but little covered, when it is forming a sharp and smooth point. *Whorls* about 6 to 7, the body-whorl large, flatly convex, narrowed towards the base. *Suture* completely hidden by enamel. *Aperture* subvertical, high and moderately broad, angled and canaliculate above, the groove sometimes broad and deep and extending often over the lower part of the spire, broadly truncated and rather deeply notched below. *Outer lip* lightly curved, thin and sharp, very often with a minute tooth below at the end of the narrow band bounding the fasciole above. *Columella* vertical, rounded, arcuately twisted, and with a number of oblique folds below, ending in a blunt beak. *Inner lip* thick, rather narrow upon the pillar, separated below by a deep groove from the fasciole ; usually forming 2 prominent pads on the parietal wall, and spreading upwards over the spire. *Operculum* thin, horny, light yellow, oval, with the nucleus subapical, the posterior end more angularly rounded than the anterior.

Diameter, 22 mm. ; height, 44 mm. (very large specimen). Diameter, 19 mm. ; height, 34 mm.

Dentition (Hutton, T.N.Z.I., xv, 121, pl. 13, f. V).—Central tooth with 3 rather distant cusps, the middle one the smallest, no intermediate smaller denticles ; lateral teeth triangular.

Type in the British Museum.

Hab.—North Island, from Bream Head to Cook Strait, also on the Manawatu coast ; Sumner (H. S.) ; Timaru (H. S.) ; Chalky Inlet ; Chatham Islands ; Kermadec Islands (Captain Bollons).

Remark.—The specimens taken for *A. rubiginosa* have a very thick callus on the spire.

Fossil in the Miocene and Pliocene.

Maori.—Enhata-Atouané and Téouara (*fide* Quoy and Gaimard).

Var. pyramidalis, Reeve, 1864. Plate 49, fig. 2.

Ancillaria pyramidalis, Rve., Conch. Icon., xv, f. 11 ; M.N.Z.M., 59 ; Chall. Rep., xv, 230.

The sculpture is exactly like that of the species, but the colouring of the central part of the body-whorl is usually much darker, deep lead-blue or bluish-brown. The spire is pyramidally acuminated, the apex sharp, the callosity covering the surface is just thick enough to form an even smooth surface, and there is only a very moderate layer of callus extending from the body-whorl to the spire on the ventral side of the shell.

Diameter, 15 mm. ; height, 29 mm.

Type in the British Museum.

Hab.—Hauraki Gulf, much more common than the species ; Cook Strait ; Nelson ; west of Cook Strait, Station 167, in 150 fathoms (" Challenger " Exped.).

Remark.—A small form of this variety, 10 mm. by 20 mm., which has the central part of the body-whorl light bluish-white, occurs at St. Helier's Bay, Auckland.

Fossil in the Pliocene.

2. Ancilla bicolor, Gray, 1847. Plate 46, fig. 20.

Ancillaria bicolor, Gray, in App. to Jukes' Voy. " Fly," ii, 1847, 357, pl. 1, f. 4. *A. novæ-zelandica*, Sowerby, Thes. Conch., iii, 1859, 65, pl. 213, f. 48, 49 ; Conch. Icon., xv, pl. 11, f. 41 ; Crit. List, 23. *Ancilla* (*Anaulax*) *nana*, Watson, Chall. Rep., xv, 1886, 230, pl. 17, f. 10.

Shell narrowly ovate, brown with whitish and darker bands, a high spire small-pointed, a concealed suture, a small mouth, and a strong labial pad. *Sculpture :* Longitudinals—there are very faint lines of growth. Spirals—the pillar and front of the shell is twisted, scored, and white, with a sharply scored upper edge ; above this is a brown band, defined above by a sharp small furrow, above which, at a little distance, is another similar but sharper furrow which runs out into a little prickle on the outer lip ; the upper part of the body-whorl is buried in enamel, banded with alternate white, brown, and pale, the succession of which makes it possible to count the whorls. *Colour* fawn, banded with white and brown. *Spire* high and small. *Apex* small, bluntly rounded, and white ; it is free from enamel. *Whorls* 6 ; the last is elongated and a very little tumid. *Suture* buried. *Mouth* narrowly oval, pointed above, truncated and emarginate in front. *Outer lip* flatly curved, thin, with a projecting point on the edge in front. *Inner lip* slightly convex on the body, concave below ; a thick labial pad loads the twisted pillar, fills the mouth above, spreads out on the body, and covers the spire. *Operculum* triangularly lanceolate, sharp-pointed above, with a terminal nucleus lying toward the outer edge, feebly lineated, thin, yellow, with a dull gloss ; it quite fills the mouth of the shell. (Watson.)

Diameter, 4·25 mm. ; height, 9·5 mm. (type of *A. nana*).

Animal unknown.

Type in the British Museum.

Hab.—Queen Charlotte Sound, near Long Island, in 10 fathoms (" Challenger ") ; Bay of Islands ; Whangarei Heads ; off Great Barrier Island, in 110 fathoms ; near Cuvier Island, in 38 fathoms (Captain Bollons) ; Hauraki Gulf, in 25 fathoms ; Manukau Harbour (Webster).

Remark.—The above synonymy is based on information kindly supplied by Mr. E. A. Smith, I.S.O., of the British Museum.

3. Ancilla depressa, Sowerby, 1859. Plate 49, fig. 3.

Ancillaria depressa, Sow., Thes. Conch., iii, 1859, 63, pl. 211, f. 3. *Ancilla depressa*, Sow.: Suter, T.N.Z.I., xxxix, 266. *Ancillaria lata*, Hutton, T.N.Z.I., xvii, 1884 (1885), 325; P.L.S. N.S.W. (2), i, 1887, 210; Plioc. M., 44, pl. 6, f. 15; Suter, T.N.Z.I., xxxviii, 332.

Shell of very variable size, broadly oval, flattened on the ventral side, solid, shining, with short spire, with a thick and broad callous pad outside the parietal wall. *Sculpture:* The callus of the spire and body minutely granulated, the last whorl microscopically finely transversely striated, a shallow narrow groove above the fasciole, the latter slightly raised, depressed in the centre, the lower third overlaid by a well-defined narrow band; growth-lines fine, sometimes raised into unequal and low plications. *Colour:* The apex white or reddish; the spire white, banded with brown below the suture, this brown band getting broad on approaching the aperture, it is distinctly margined below by a white band of very variable width; middle of the body-whorl bluish-brown, vertically striated with bluish-white; the upper third of the fasciole white or dark brown like the central part, the lower part whitish; columella white, parietal wall brown or white; aperture fuscous within; outer lip with a white margin. *Spire* typically short, but in the larger forms it is more elongated, its height about half that of the aperture, but it is very often much more; outlines concave. *Protoconch* small, sharply conical, mostly free of enamel. *Whorls* about 6, the body-whorl strongly convex below the suture, but flattened on the ventral side, flatly rounded and somewhat narrowed toward the base. *Suture* concealed by enamel. *Aperture* slightly oblique, lightly channelled above, very little narrowed below, broadly truncated and deeply notched at the base. *Outer lip* obliquely curved above, then lightly convex or nearly straight, sharply rounded towards the emargination, thin and sharp, with a minute denticle below. *Columella* straight or very lightly concave, vertical, thick and rounded, strongly twisted and with 3 to 4 flattish oblique plaits below. *Inner lip* narrow on the columella, separated by a narrow oblique groove from the fasciole, extending over the concave parietal wall as a thick callous layer, produced into a thick pad outside the angle of the aperture, and forming a thinner callous layer outside and upon the spire, often very nearly reaching the protoconch. *Operculum* thin and horny, yellowish, oval, broadly rounded in front, lightly acuminate behind, with fine concentric and a few radiate lines, nucleus nearly apical.

Diameter, 8·5 mm.; height, 15 mm. (figure of type). Diameter, 12 mm.; height, 22 mm. (Whangaroa specimen). Diameter, 9·5 mm.; height, 17 mm. (Auckland specimen). Diameter, 12 mm.; height, 22 mm. (type of *A. lata*).

Animal unknown.

Type in the British Museum. The type of *A. lata*, Hutt., is in the Canterbury Museum, Christchurch.

Hab.—Whangaroa Harbour (C. Traill); Hauraki Gulf, on sandy beaches, between tide-marks; Manukau Harbour (C. Spencer); Titahi Bay and Lyall Bay, Cook Strait; Banks Peninsula (Iredale).

Remark.—The fossil specimens from Wanganui are mostly much larger than Recent examples, and have usually a higher spire. From Waikopiro I have fossil shells which very closely approach the type of *A. depressa*.

Fossil in the Miocene and Pliocene.

4. Ancilla mucronata, Sowerby, 1830. Plate 49, fig. 4.

Ancillaria mucronata, Sow., Spec. Conch., pt. 1, 8, f. 47, 48, 1830; Thes. Conch., iii, 63, pl. 211, f. 11, 12, 14; Kiener, Icon., 7, pl. 3, f. 3; Conch. Icon., xv, pl. 4, f. 10; Küster, Conch. Cab., 20, pl. 6, f. 3, 4; Man. Conch. (1), v, pl. 38, f. 31. *Ancilla mucronata*, Sow., Chall. Rep., xv, 229; T.N.Z.I., xxxviii, 287; *Ancillaria albisulcata*, Sow.: Quoy and Gaimard, Voy. Astrol., iii, 19, pl. 49, f. 5–12; Dieff. N.Z., 235, not of Sowerby.

Shell somewhat cylindrically oblong, varying very much in size, thick, very callous towards the apex, fawn colour. *Sculpture* consisting of very fine granules on the callus of the spire, fine spiral striæ on the body-whorl, more distant than in *australis*, with a shallow groove above the fasciole; growth-lines fine, a little oblique, faintly reticulating the spiral lines. *Colour:* The mucronate apex reddish-brown; the spire light fuscous, darker at the suture; middle of body-whorl fawn colour, with a narrow white band above and below; fasciole light brown, columella white, aperture inside fawn colour. *Spire* moderately elevated, conical, the apex mucronate, its height a little more than half that of the aperture; outlines lightly convex. *Protoconch* small, sharply pointed, emerging suddenly out of the thick callus. *Whorls* of the spire covered by a thick callus, somewhat thickened on the ventral side; body-whorl moderately convex, not ventricose, narrowed towards the base. *Suture* hidden by enamel. *Aperture* large, high and rather narrow, angled above, broadly truncated and moderately notched below. *Outer lip* lightly convex, thin, the edge rounded, and with a small sharp tooth outside the groove above the fasciole. *Columella* vertical, a little excavated on meeting the faintly convex parietal wall, strongly twisted and ornamented with 5 to 7 oblique small plaits below. The *inner lip* narrow upon the pillar, separated by a groove from the fasciole, spreading over the parietal wall, body-whorl, and part of the spire; there is usually a thick vertical callous layer on the body stretching from the pillar up to the upper part of the aperture. *Fasciole* with two depressions, smooth, the sinuated growth-periods mostly indistinct. *Operculum* unknown.

Diameter, 21 mm.; height, 45 mm. (Cape Farewell). Diameter, 17 mm.; height, 36 mm. (Auckland Harbour). Diameter, 15 mm.; height, 34 mm. (off Great Barrier, 110 fathoms). Diameter, 11 mm.; height, 22 mm. (Cape Maria van Diemen).

Animal yellowish-white spotted with reddish-brown; the siphon and posterior part of the foot are marked in the same way; the remainder is milk-white.

Dentition unknown.

Type in the British Museum.

Hab.—Cook Strait, in a few fathoms ("Astrolabe"); Queen Charlotte Sound, near Long Island, in 10 fathoms ("Challenger"); Cape Farewell; Nelson; off Great Barrier Island, in 110 fathoms; near Channel Island, Hauraki Gulf, in 25 fathoms; Auckland Harbour, in 5 fathoms (H. S.); Cape Maria van Diemen.

Remark.—I have never seen this species in the littoral zone. Reeve gives Tasmania and Sowerby Australia as the habitat of the species, but this is undoubtedly erroneous; it is no doubt precinctive to New Zealand.

Fossil in the Pliocene.

Fam. **MARGINELLIDÆ**, Adams.

Animal having tentacles arising close together, the eyes on the lower portion or near the middle of the tentacles; mantle with expanded side lobes, covering the back of the shell; siphon elongate, simple at the base; foot large, truncate in front, produced behind. Operculum usually none. Formula of radula 0+1+0.

Shell porcellanous, polished, usually smooth or with longitudinal ribs; spire short or immersed; body-whorl ample; aperture nearly the length of the shell; the outer lip usually with thickened margin, smooth or dentated within; the inner lip with several distinct plaits on the columella.

Fossil from the Eocene.

Key to Genera.

A. Shell with 4 columella plaits; without a basal limb .. Marginella.
B. Shell with more than 4 columellar plaits; a basal limb present Cryptospira.

Genus 1. Marginella, Lamarck, 1801.

Marginella, Lam., Syst. A.s.V., 1801, 75, Type: *Voluta glabella*, L.

Animal large, but able to draw back into the shell; foot large, broad and subtruncated in front, obtuse or lightly attenuated behind; tentacles long, cylindrical, sharply pointed, the eyes on the outer sides at about the lower third, situated on ommatophores, which are united with the tentacles. Tooth of the radula transverse, with a great number of small and sharp denticles.

Shell mostly small, ovately oblong to subcylindrical, polished, mostly smooth, but sometimes with axial ribs; spire short and conical; aperture narrow, elongated, sometimes emarginate at the base; outer lip more or less varicose, its inner margin smooth or denticulate; columella plicate.

Several hundred Recent species have been described. They live on sandy and rocky coasts of warm and tropical seas. Found in depths to 390 fathoms.

Fossil in the Tertiary from the Eocene.

Key to Subgenera.

A. Shell oval, usually with a basal sinus; spire moderately elevated; the varix of the outer lip not ascending on the spire .. .. Marginella.
B. Shell cylindrical; the outer lip usually contracted and without a varix; spire very short .. .. Volvarina.
C. Shell with a prominent spire, the base not emarginate; the varix of the outer lip ascending more or less on the spire; the lowest two plaits usually close together .. .. Glabella.

Subgen. 1. Marginella, s. str.

Sect. 1. Marginella, s.s.

Shell ovoid or ovato-conic, somewhat ventricose above; the spire usually short, not exceeding in height that of the aperture; protoconch paucispiral, the nucleus depressed; the whole surface covered with enamel; the suture linear, indistinct; the body-whorl narrowed towards the base; aperture high and narrow, somewhat channelled above, truncated and mostly lightly emarginate at the base; outer lip thick, with an outer varix, lightly retrocurrent toward the suture, smooth inside; columella oblique, nearly straight, with 4 rather distant and slender plaits, the uppermost almost transverse, the lowest nearly vertical and extending to the basal margin; inner lip very thin, not easily distinguished from the enamel which covers the shell.

Key to Species.

A. Outer lip smooth inside.
a. Height of spire a little less than that of the aperture; apex obtuse .. .. *fusula.*
aa. Height of spire a little less than half that of the aperture; apex sharp .. .. *Stewartiana.*
B. Outer lip with a few tubercles inside; shell biconic? height of spire a little less than that of the aperture .. .. *Allporti.*

1. Marginella fusula, Murdoch and Suter, 1906. Plate 20, fig. 9.

Marginella fusula, M. & S., T.N.Z.I., xxxviii, 1905 (1906), 289, pl. 23, f. 23, 24.

Shell small, rather thin, oval-conic, smooth and glossy, and with a much produced spire. *Sculpture* consisting of low rounded growth-periods, numerous and irregular, usually more marked on the last half-volution. *Colour* white or with a faint yellow tinge; occasionally some indistinct brown markings which form 2 spots on the outer lip, and seem to indicate the presence of 2 brown spiral bands on the body-whorl in fresh specimens. *Spire* produced, a little shorter than the aperture, conical, with an obtuse rounded apex. *Protoconch* paucispiral, smooth, rounded, nucleus depressed. *Whorls* 4, flatly

convex, the last produced and narrowed anteriorly; with a slight but distinct swelling which proceeds as a pad from opposite the posterior columellar plait and sweeps out and forwards. *Suture* distinct, lightly impressed. *Aperture* elongate, narrow, subchannelled above, broadly rounded at the base. *Outer lip* very slightly reflected and thickened, smooth inside, a little retrocurrent at its insertion. *Inner lip* forming a narrow callus upon the oblique, almost straight body. *Columella* subvertical, with 4 evenly spaced rather thin plaits, the superior short and almost transverse, the next sloping, but less oblique than the succeeding two, the lower of which is a little twisted and margins the very short open canal.

Diameter, 3·1 mm.; height, 6·9 mm. (type).

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms (type).

Remark.—It is larger than the allied *M. Allporti*, and has no tubercles on the outer lip, but the indication of brown spiral bands connects it with that species.

2. Marginella Stewartiana, Suter, 1908. Plate 20, fig. 10.

Marginella Stewartiana, Suter, P. Mal. S., viii, 1908, 183, pl. 7, f. 12.

Shell small, elongately oval, smooth and polished, white, with an elevated spire. There is no *sculpture*. *Colour* white. *Spire* elevated, conic, with a pointed apex, its height less than half that of the aperture. *Protoconch* small, smooth, rounded. *Whorls* 3, the last high, moderately convex, narrowed towards the base, spire-whorls flatly rounded. *Suture* lightly impressed, narrowly margined below. *Aperture* oblique, high and narrow, lightly channelled above, truncated and not notched below. *Outer lip* oblique, straight and thickened at the middle, lightly retrocurrent and with a narrow sinus above, smooth inside. *Columella* faintly concave, with 4 subequidistant slender and oblique plaits, the lower two more prominent, the last extending to the basal margin. *Inner lip* thin and transparent.

Diameter, 2·3 mm.; height, 4·6 mm.

Animal unknown.

Type in my collection.

Hab.—Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons).

Remark.—This species is very closely allied to *M. hebescens*, M. & S., but it is more elongate, the spire more acuminate and with a much sharper apex, and the suture is less impressed.

Sect. 2. Eratoidea, Weinkauff, 1878.

Eratoidea, Weinkauff, Küster's Conch. Cab., 1878, 120, 140. Type: *Marginella margarita*, Kiener. *Denticuloglabella*, Sacco, 1889.

Shell ventricose, not much elongated; spire short; whorls convex; suture impressed, the last whorl oval, rounded and sometimes plicated

above, regularly contracted towards the base; aperture not very high, narrow, very little emarginate at the base; outer lip without an upper sinus, with a thick varix, crenate inside, the denticles mostly distant and the uppermost more prominent than the others; columella with 4 plaits, the two upper ones transverse, the others oblique; inner lip indistinct, sometimes with a well-marked callosity above.

3. Marginella Allporti, T.-Woods, 1876. Plate 20, fig. 11.

Marginella Allporti, T.-Woods, P.R.S. Tas., 1875 (1876), 28; Tate and May, P.L.S. N.S.W., 1901, 362, pl. 26, f. 80; Hedley, Rec. A.M., vi. 295. *M. kemblensis*, Hedley, Mem. A.M., iv, 365, f. 88.

Shell small, biconical, thin, translucent, glossy, smooth, white, usually with 2 brown spiral bands. There is no *sculpture*. *Colour* yellowish-white, a narrow upper and a broader lower spiral band of rufous mostly present, or, if absent, 2 brown spots usually remain on the outer lip. *Spire* elevated, conic, with a blunt apex, its height a little less than that of the aperture. *Protoconch* flatly rounded. *Whorls* 5, lightly convex, sometimes somewhat constricted below at the suture; the last whorl large, moderately convex, narrowed towards the base. *Suture* superficial. *Aperture* oblique, narrow, a little channelled above, roundly truncated below. *Outer lip* almost straight, slightly retrocurrent towards the suture, with a distinct varix, with 1 or several tubercles inside, the uppermost more prominent. *Columella* oblique, with 4 subequidistant oblique strong plaits, the upper two more transverse. *Inner lip* usually extending some distance over the base just outside the plaits.

Diameter, 2·5 mm.: height, 4·6 mm.

Animal unknown.

Type in the Tasmanian Museum, Hobart.

Hab.—Five miles south of Cuvier Island, in 38 fathoms (Captain Bollons); near Little Barrier Island, in 20 fathoms (R. H. Shakespear); near Channel Island, Hauraki Gulf, in 25 fathoms; Lyall Bay (A. Hamilton).

Subgen. 2. Volvarina, Hinds, 1844.

Volvarina, Hinds, P.Z.S., 1844, 75. Type: *Marginella triticea*, Lam.

Shell small, cylindrical or narrowly ovoid; spire short, conoidal, the apex obtuse; whorls slightly convex, the suture indistinct, the last whorl forming five-sixths or seven-eighths of the total height, lightly oval, attenuated towards the base; aperture very high, contracted above and lightly channelled, truncated and not emarginate below; outer lip a little arcuate, but little thickened, contracted near the middle, without an outer varix, smooth inside, retrocurrent towards the suture; columella with 4 oblique plaits, which are situated rather low down.

KEY TO SPECIES.

A. Height of shell 6 mm. or less; colour white, rarely with 2 yellow spiral bands; outer lip smooth inside .. .. .. *albescens.*
B. Height of shell 8 mm. or more; body-whorl with a median brown band, or the shell may be quite white; outer lip smooth or slightly crenate inside .. .. *mustelina.*

4. Marginella albescens, Hutton, 1873. Plate 20, fig. 12.

Marginella albescens, Hutt., C.M.M., 19; M.N.Z.M., 62; Suter, T.N.Z.I., xxxviii, 331. *M.* (*Volvaria*) *infans*, Reeve: Hutton, T.N.Z.I., xvi, 224; Index, 74, not of Reeve.

Shell small, cylindrical, thin and fragile, translucent, polished, smooth, white. The only *sculpture* consists of microscopic straight and fine growth-lines. *Colour* white, rarely with indications of 2 yellow spiral bands, sometimes with a faint median white band on the body-whorl. *Spire* low, conoidal. *Protoconch* small, flatly convex. *Whorls* 3 to 4, the last occupying nearly the whole height of the shell, lightly convex. *Suture* indistinct. *Aperture* high and narrow, lightly channelled above, roundly truncated below. *Outer lip* vertical, straight, retrocurrent towards the suture, with a faint indication of an outer varix, thickened and smooth within. *Columella* a little oblique, with 4 oblique and equidistant sharp plaits. The *inner lip* very thin and transparent.

Diameter, 2·5 mm.; height, 5 mm. (type). Diameter, 1·8 mm.; height, 3·8 mm. (Foveaux Strait, 15 fathoms). Diameter, 3 mm.; height, 6·1 mm. (Cuvier Island, 38 fathoms).

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Stewart Island (type); Foveaux Strait, in 15 fathoms; Cuvier Island, in 38 fathoms; Chatham Islands; near the Snares and Bounty Islands, in 50 fathoms (Captain Bollons).

Remark.—A very variable shell with regard to size. I have not seen any specimens with indications of 2 yellow spiral bands.

Fossil in the Miocene.

5. Marginella mustelina, Angas, 1871. Plate 20, fig. 13.

Hyalina (*Volvarina*) *mustelina*, Ang., P.Z.S., 1871, 14, pl. 1, f. 5. *Marginella mustelina*, Angas: Hedley, Mem. A.M., iv, 1903, 366; Index, 74; Man. Conch. (1), v, 48, pl. 12, f. 87. *M. Stanislas*, T.-Woods, P.R.S. Tas., 1876 (1877), 133; Tate and May, P.L.S. N.S.W., xxvi, 362, pl. 26, f. 82.

Shell moderately large, cylindrical, thin, translucent, with a broad spiral brown band on the middle. There is no *sculpture* whatever, the whole shell being smooth and polished. *Colour* yellowish-white; suture with a narrow brown band, which may widen upon the body-whorl, but usually a second narrow band is present, and this is separated by a narrow white band from the median dark-brown spiral band; base with a narrow brown band; the narrow brown bands above and below are sometimes dissolved into spots. *Spire* very low,

conoidal. *Protoconch* broadly rounded. *Whorls* 4, the last very high and flatly convex. *Suture* indistinct. *Aperture* high and narrow, subchannelled above, truncate below, but not notched. *Outer lip* vertical, nearly straight, retrocurrent towards the suture, with an obsolete outer varix, thickened at the middle, and smooth or minutely crenate within. *Columella* subvertical, with 4 equidistant oblique plaits, the lowest two slightly more oblique than the others. *Inner lip* very thin, transparent, broadly expanded over the body.

Diameter, 4·2 mm.; height, 8·3 mm. (Tauranga specimen).

Animal unknown.

Type in the British Museum.

Hab.—Bay of Islands; Whangarei Heads (C. Cooper); Mokohinau Group; Great Barrier Island; Tauranga (C. Spencer). The type was dredged by Mr. Brazier off "Sow and Pigs," in Port Jackson.

Remark.—This species is very variable in size; the colour may be pure-white, and the outer lip smooth or crenate. Hedley suggests that "the name *Stanislas* may be retained in a varietal sense for the large white form which in warmer latitudes is restricted to deep water."

Subgen. 3. Glabella, Swainson, 1840.

Glabella, Swains., "Malacology," 1840, 324. Type: *Marginella prunum*, Gmel. *Prunum*, H. and A. Adams, 1853. *Egouena*, Jouss., 1875. *Porcellana*, Conr., 1862.

Shell fairly large, ovoid, sometimes a little ventricose; spire short, conoidal, with pointed apex; protoconch small, obtuse, and indistinct; whorls 3 to 5, impressed at the suture, the last nearly the whole height of the shell, oval, regularly attenuated at the base, which is not or only lightly sinuated; aperture very narrow above, channelled, the channel sometimes excavating the outer lip, slightly widened below, terminating in a but-little-marked sinus; outer lip lightly oblique, somewhat convex, very thick, smooth and reflected inside, with a marginal rounded varix, extending along the basal sinuosity, almost always ascending upon the spire, sometimes to the apex, with a depression opposite the upper channel; columella oblique, straight, with 4 rather strong plaits, the two lower ones closer together; inner lip often callous and spreading over the body, but always limited below and joining the extension of the labial varix over the base.

Key to Species.

A. Shell with axial sculpture, though not prominent.
  a. Body-whorl shouldered; rounded axial riblets at the shoulder; 5 mm. by 9 mm. .. .. .. *turbinata.*
  aa. Body-whorl convex.
    b. Shell oviform, with fine axial striæ; height of spire about one-fifth that of the aperture: 1·7 mm. by 3·1 mm. .. .. *parvistriata.*
    bb. Shell volutiform, with fine axial plications; aperture nearly as high as the shell; 1·7 mm. by 3 mm. .. *plicatula.*

B. Shell without sculpture; growth-lines only.
  a. Height of spire one-quarter to one-third that of the aperture; shell volutiform; 4 mm. by 5½ mm. to 7 mm. .. *pygmæa.*
  aa. Height of spire about half that of the aperture.
    b. Outer lip faintly crenate inside; 3 whorls; body-whorl somewhat swollen above; 2·4 mm. by 4·2 mm. .. *amœna.*
    bb. Outer lip smooth inside.
      c. Shell moderately large, height about 13 mm.; suture lightly margined; 5 whorls, sometimes with irregular plications at the suture; 7·5 mm. by 13 mm. .. .. *muscaria.*
      cc. Shell small, height about 3 mm. to 4 mm.
        d. Suture submargined; spire-whorls rounded; 4 whorls; 2·1 mm. by 3·8 mm. .. *hebescens.*
        dd. Suture simple; spire-whorls flat; 3 whorls; 1·5 mm. by 3 mm. .. .. .. *lurida.*

6. Marginella amœna, Suter, 1908. Plate 20, fig. 14.

Marginella (*Glabella*) *amœna*, Suter, P. Mal. S., viii, 1908, 184, pl. 7, f. 15.

Shell small, ovate, rather solid, smooth and polished, with a moderately raised spire, white. There is no *sculpture*. *Colour* white; fresh shells vitreous. *Spire* conoidal, with a blunt apex, a little less than half the height of the aperture; outlines straight. *Protoconch* very small, broadly rounded. *Whorls* 3; the spire-whorls flat; body-whorl large, convex, somewhat inflated above, narrowed towards the base. *Suture* indistinct, not impressed. *Aperture* slightly oblique, high and narrow, the margins subparallel, lightly channelled above, truncated and not notched below. *Outer lip* somewhat convex, thickened, the inner margin faintly and minutely crenate, with an outer varix which does not extend much upon the spire, slightly sinuate above. *Columella* oblique, straight, with 4 nearly equidistant strong plaits, the upper two almost transverse, the lower two more oblique, the lowest extending to the basal margin. *Inner lip* thin and transparent.

Diameter, 2·4 mm.; height, 4·2 mm.

Animal unknown.

Type in my collection.

Hab.—Near the Snares, in 50 fathoms (Captain Bollons).

Remark. — This species is very nearly allied to *M. hebescens*, M. & S., but is distinguished from it in being a little larger and more ventricose, having the spire slightly lower and broader, the spire-whorls flat, the protoconch much smaller, the suture not impressed, and the outer lip minutely crenate.

7. Marginella hebescens, Murdoch and Suter, 1906. Plate 20, fig. 15.

Marginella hebescens, M. & S., T.N.Z.I., xxxviii, 1905 (1906), 290, pl. 23, f. 25, 26.

Shell small, moderately solid, suboval, smooth and polished. The *sculpture* consists of irregular minute and smooth growth-periods. *Colour* white or pale-creamy, pellucid when fresh. *Spire* elevated

and with a blunt apex, about half the height of the aperture. *Protoconch* paucispiral, smooth, broadly rounded, with a flat small nucleus. *Whorls* 4, lightly rounded, the last narrowed at the base and with a distinct swelling curving out and forward from the columella; base convex. *Suture* rather broadly impressed and submargined below. *Aperture* high and narrow, margins subparallel, with an indistinct channel above. *Outer lip* slightly reflected, with a distinct varix, a little retrocurrent at its insertion, with a minute sinus above. *Columella* slightly oblique, nearly straight, with 4 equidistant strong plaits, the first transverse, the following two oblique, and the last subvertical and margining the very short broad and anteriorly rounded canal. *Inner lip* narrow on the oblique, somewhat convex body.

Diameter, 2·1 mm.; height, 3·8 mm. (type).

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms (type).

Remark.—This species is allied to *M. Allporti*, but is distinguished from it by the shorter spire and higher aperture, the bluntly rounded apex, the stronger columella plaits, and the absence of all colour-markings.

8. Marginella lurida, Suter, 1908. Plate 20, fig. 16.

Marginella (*Glabella*) *lurida*, Suter, P. Mal. S., viii, 1908, 183, pl. 7, f. 14.

Shell very small narrowly oval, smooth and shining, white, translucent when fresh, with a moderately elevated spire. There is no *sculpture*. *Colour* white, but fresh shells are vitreous. *Spire* elevated, conic, about half the height of the aperture. *Protoconch* obtuse, rounded. *Whorls* 3, the last high, moderately convex, narrowed towards the base, the spire-whorls flattish. *Suture* superficial. *Aperture* oblique, narrow, widening below, lightly channelled above, truncated and flatly rounded at the base. *Outer lip* lightly convex, thickened at the middle, with a low outer varix, smooth inside, retrocurrent toward the suture, and with a shallow sinus. *Columella* oblique, with 4 equidistant strong plaits, the lowest twisted and extending to the basal margin.

Diameter, 1·5 mm.; height, 3 mm.

Animal unknown.

Type in my collection.

Hab.—Foveaux Strait, in 15 fathoms (type); near the Snares and Bounty Islands, in 50 fathoms (Captain Bollons).

9. Marginella muscaria, Lamarck, 1822. Plate 46, fig. 21.

Marginella muscaria, Lam., A.s.V., x, 1822, 441; Kiener, Icon. Coq. Viv., 1834, pl. 3, f. 14; Thes. Conch., i, 1846, 376, pl. 75, f. 45–47; Conch. Icon., xv, 1864, pl. 8, f. 29; Pritchard and Gatliff, P.R.S. Vic., xi (n.s.), 189; Tate and May, P.L.S. N.S.W., 1901, 362; Gillies, T.N.Z.I., xiv, 170; Hutton, T.N.Z.I., xvi, 224. *Eratoo lactea*, Hutton, M.N.Z.M., 63, 202. *Marginella formicula*, Lam.: Tryon, Man. Conch. (1), v, 23, pl. 6, f. 3; not of Lamarck.

Shell moderately large, ovoid, the spire produced, porcellanous, fairly solid, columella with 4 plaits. *Sculpture* formed by fine growth-lines only, sometimes with fine irregular plications below the suture on the last two whorls. *Colour* light yellow or white, the labial varix pure-white. *Spire* conoidal, obtuse, half the height of the aperture, somewhat scalar ; outlines nearly straight. *Protoconch* small, broadly convex. *Whorls* 5, the last very high, convex, much impressed along the suture ; base narrowed. *Suture* indistinct, lightly margined above. *Aperture* high and narrow above, somewhat widened below, channelled above, the channel cutting into the outer lip, broadly truncated and lightly notched below. *Outer lip* vertical, thick, and rounded, with a prominent smooth varix extending along the basal sinus and running above to the middle of the penultimate whorl, smooth within. *Columella* oblique, straight, broadly rounded, with 4 strong plaits, the first transverse, the lower three oblique, the lower two very close together. *Inner lip* rather thick, spreading broadly over the lightly concave parietal wall and the body, with an elongated tubercle outside the channel.

Diameter, 7·5 mm. ; height, 13 mm.

Animal unknown.

Type in the Mus. Hist. Nat., Geneva.

Hab.—Auckland to Cook Strait ; apparently a rare shell. Also Tasmania and Australia.

Remark.—The type of *E. lactea*, Hutt., collected by Dr. Sinclair, is in the Dominion Museum.

10. Marginella parvistriata, Suter, 1908. Plate 20, fig. 17.

Marginella (*Glabella*) *parvistriata*, Suter, P. Mal. S., viii, 183, pl. 7, f. 13.

Shell very small, oviform, semitransparent, dull, white, axially finely striated, with a short spire. *Sculpture* consisting of minute close and straight axial striæ, continuous over the spire to the body-whorl. *Colour* white or yellowish-white. *Spire* short, conoidal, with a blunt apex, its height about one-fifth that of the aperture. *Protoconch* smooth, broadly convex. *Whorls* 3, flat on the spire, body-whorl high, moderately convex, slightly narrowed towards the base. *Suture* indistinct. *Aperture* high and narrow, a little wider below, subchannelled above, roundly truncated at the base. *Outer lip* lightly convex, vertical, a little retrocurrent toward the suture, thickened and rounded, smooth inside, with an outer varix extending a short way up the spire and across the basal margin. *Columella* a little oblique, with 4 oblique nearly equidistant strong plaits. *Inner lip* broad and thin, distinct only outside the columella ; parietal wall lightly convex.

Diameter, 1·7 mm. ; height, 3·1 mm.

Animal unknown.

Type in my collection.

Hab.—Foveaux Strait, in 15 fathoms.

11. Marginella plicatula, Suter, 1910. Plate 20, figs. 18. 18*a*.

Marginella (*Glabella*) *plicatula*, Suter, Subantarct. Islds. N.Zeal., i, 1909, 29, pl. 1, f. 4, 5.

Shell very small, volutiform, fairly solid, white, axially finely plaited. The *sculpture* consists of very fine subequidistant axial plications. *Colour* a dirty white. *Spire* very little raised, broadly conoidal, with obtuse apex. *Whorls* about 3, the last large, convex, slightly contracted at the base. *Suture* inconspicuous. *Aperture* high and narrow, almost as high as the shell. *Outer lip* thickened, smooth inside, with an outer varix extending along the base. *Columella* slightly oblique, almost straight, with 4 prominent plaits, the upper two more transverse than the lower two, which are much closer together. *Inner lip* very narrow.

Diameter, 1·7 mm.; height, 3 mm.

Type in the Canterbury Museum, Christchurch.

Hab.—Ten miles north of Enderby Island, Auckland Islands, in 85 fathoms (Edgar R. Waite); one specimen.

12. Marginella pygmæa, Sowerby, 1846. Plate 20, fig. 19.

Marginella pygmæa, Sow., Thes. Conch., i, 1846, 386, pl. 75, f. 78, 79; Conch. Icon., xv, pl. 23, f. 125; Pritchard and Gatliff, P.R.S. Vic., xi (n.s.), 191. *M. volutiformis*, Reeve, Conch. Icon., xv, pl. 24, f. 131; Tate and May, P.L.S. N.S.W., 1901, 362. *M. translucida*, Sowerby: Tryon, Man. Conch. (1), v, 26, pl. 8, f. 35; not of Sowerby. *M. turbinata*, Sowerby: Tryon, Man. Conch. (1), v, 93, pl. 7, f. 5; not of Sowerby.

Shell small, volutiform, solid, subtransparent, yellowish-white, smooth. There is no *sculpture* except fine growth-striæ. *Colour* yellowish-white, the outer lip white. *Spire* low, conoidal, somewhat variable in height, usually a quarter to a third the height of the aperture. *Protoconch* convex, smooth. *Whorls* 4, the last large and moderately convex, narrowed below, spire-whorls but faintly convex. *Suture* indistinct, often margined below by a white narrow band. *Aperture* high and narrow above, widening towards the base, channelled above, the outer lip but little incised, truncated and very lightly emarginate below. *Outer lip* thickened, smooth inside, with an outer varix extending across the base to the inner lip. *Columella* lightly oblique, straight, with 4 subequidistant prominent plaits; the upper two thin, sharp, and nearly transverse; the lower two somewhat stouter and oblique. *Inner lip* thin, shining, extending over the lightly convex parietal wall and the greater part of the ventral side of the body.

Diameter, 4 mm.; height, 7 mm. (Mokohinau Group specimen). Diameter, 4 mm.; height, 5·5 mm. (Foveaux Strait specimen).

Animal unknown.

Type in the British Museum.

Hab.—Bay of Islands; Whangarei Heads (C. Cooper); Mokohinau Group; Hauraki Gulf; Foveaux Strait; Chatham Islands: sometimes found crawling near low-water mark in sandy places. Also Tasmania and Australia.

13. Marginella turbinata, Sowerby, 1846. Plate 20, fig. 20.

Marginella turbinata, Sow., Thes. Conch., i, 1846, 385, pl. 75, f. 70, 71; Conch. Icon., xv, pl. 22, f. 122; Küster, Conch. Cab., 1879, 86, pl. 16, f. 9; Man. Conch. (1), v, 23, pl. 7, f. 4; Chall. Rep., xv, 265; Harris, C. Tert. M.B.M., i, 87; Pritchard and Gatliff, P.R.S. Vic., xi (n.s.), 191; Tate and May, P.L.S. N.S.W., 1901, 362; Index, 74.

Shell small, volutiform, solid and polished, slightly plicate on the shoulder of the body-whorl, with a short spire. *Sculpture* consisting of regularly spaced rounded riblets on the shoulder of the body-whorl, not extending over the base, sometimes obsolete. *Colour* faintly yellowish-white, the lips pure-white. *Spire* short, conoidal. *Protoconch* broadly rounded. *Whorls* $3\frac{1}{2}$ to 4, the last large, subangulate on the shoulder, much narrowed below. *Suture* very indistinct. *Aperture* nearly as high as the shell, narrow, but slightly widening below, lightly channelled above, the outer lip very little incised, broadly truncated and but little emarginate below. *Outer lip* much thickened, smooth and reflected inside, the varix extending over the basal margin to the inner lip, above close to the apex. *Columella* oblique, straight, with 4 distinct plaits, the three lower ones oblique and close together, the remaining one transverse. *Inner lip* spreading over the faintly convex parietal wall and broadly over the body.

Diameter, 5 mm.; height, 9 mm.

Animal unknown.

Type in the British Museum.

Hab.—Cape Maria van Diemen (Miss Robison); Spirits Bay (C. Cooper): in deep water. Also Tasmania and Australia. The type is from Port Jackson.

Genus 2. Cryptospira, Hinds, 1844.

Cryptospira, Hinds, Voy. "Sulphur," 1844, ii, 46. Type: *Marginella quinqueplicata*, Lam.

Shell oval, sometimes ventricose above; spire hardly raised; basal limb callous and well limited; aperture narrow, with a basal sinus; outer lip more or less thickened, smooth or plicated inside; columella with 5 plaits, and very often a few additional ridges on the parietal wall.

Subgen. 1. Gibberula, Swainson, 1840.

Gibberula, Swains., "Malacology," 1840, 323. Type: *Voluta miliaria*, L. *Microspira*, Conrad, 1862. *Granula*, Jousseaume, 1875.

Shell small and vitreous, thin; spire hardly prominent, the last whorl forming nearly the whole of the shell; basal limb large and callous, limited by an obtuse ridge; aperture very narrow above, deeply notched at the base; outer lip not very thick, retrocurrent towards the suture, without an outer varix, smooth or crenate inside; columella with 2, 3, or 4 plaits below, and a number of parietal ridges in addition; inner lip distinct and extending the whole length of the aperture.

1. **Cryptospira ficula,** Murdoch and Suter, 1906. Plate 20, fig. 21.

Cryptospira (*Gibberula*) *ficula*, M. & S., T.N.Z.I., xxxviii, 1905 (1906), 291, pl. 24, f. 27.

Shell very small, subpyriform, smooth and polished, with but very slightly raised spire. *Sculpture:* Some examples show minute growth-periods, more distinct on approaching the lip. *Colour* whitish, vitreous in fresh shells. *Spire* very little elevated, broadly rounded. *Protoconch* of about 1½ whorls, smooth, flattened, the nucleus but slightly raised. *Whorls* 3 to 3½, those of the spire very low and narrow, the last occupying nearly the whole of the shell, rounded and lightly ventricose above, narrowed toward the base; basal limb large and callous, corresponding to the growth-periods of the notch, bordered by a minute ridge. *Suture* minute but distinct. *Aperture* very narrow above, channelled, slightly broader towards the base, where it is deeply notched. *Outer lip* very little thickened, almost straight, retrocurrent in a half-circle towards the suture, rounded off on the base; in adult specimens the inner margin of the lip minutely transversely denticulate. *Columella* slightly excavated, with 3 small but distinct plaits; they are oblique, equidistant, and the last extends to the rounded basal point of the columella; 2 or 3 minute denticles are sometimes distinctly visible on the parietal wall, situate above the others. *Inner lip* thin and narrow on the lightly convex body, broadening and thickening on the columella.

Diameter, 2·2 mm.; height, 3·5 mm. (type).

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms (type).

Remark.—The nearest ally of this species is *C. Strangei*, Angas, from Australia and Tasmania, which, however, is larger, with the spire considerably more produced and the upper columella plaits more distinctly exserted.

Subgen. 2. Closia, Gray, 1857.

Closia, Gray, Guide Moll. Brit. Mus., 1857, 36. Type: *Marginella sarda*, Kiener.

Shell ovoid and globular; spire involute, hidden by the prolongation of the labial varix; outer lip thick, dentate within; columella with a thick callus, with 4 plaits, the two lower ones very prominent, the two superior ones not so prominent, above them there are sometimes a series of transverse ridges.

In its dorsal aspect it resembles *Cypræa*.

2. **Cryptospira profunda,** Suter, 1909. Plate 20, fig. 22.

Cryptospira (*Closia*) *profunda*, Suter, Rec. Canterbury Museum, i, No. 2, 1909, 128, pl. 12, f. 5.

Shell small, ovoid, smooth and polished, white, with 4 columellar plaits. The only *sculpture* consists of very faint rounded growth-periods. *Colour* white. *Spire* involute, flat, covered by enamel.

The last *whorl* occupies the whole height of the shell; it is lightly convex, narrowed below, with a light basal limb. *Aperture* high and narrow, arched, narrowly rounded above, slightly emarginate below. *Outer lip* convex, thickened, with a light varix, extending above beyond the spire and concealing it, inside lightly crenate. *Columella* oblique, straight, with 4 almost transverse plaits, the lower two stronger than the others.

Diameter, 3·8 mm.; height, 5·8 mm.

Animal unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—Off south-east of Cape Saunders, in 100 fathoms (E. R. Waite).

Tribe 2. TOXOGLOSSA.

Stenoglossa without jaws; the radula normal, formula 1+0+1, but exceptionally a central tooth is present, and sometimes an additional lateral tooth on each side, the formula being 1−1+1+1−1. A "poison-gland" is present, whose duct traverses the nerve-collar. The digestive tube is very narrow. The branchiæ number two, and are unequal. The siphon is long, slit longitudinally. The male organ is well developed, and situated on the right side of the body.

The animal is carnivorous, and exclusively marine.

Fam. **TURRITIDÆ**, H. and A. Adams.

Pleurotomatidæ, Lovén.

Animal with widely separated tentacles, the eyes usually at or near their base; mantle generally with a sinus at the right margin corresponding with the sinus of the shell; siphon long. Dentition: Usually there is no central tooth, and the laterals are a single one on either side of the lingual band; but in some groups there is a central tooth, and in others there are 2 laterals. No jaws. The teeth are long, usually subulate, supplied with venom from a large gland.

Shell fusiform, with a more or less produced anterior canal, and a slit or sinus on the outer margin of the aperture near the suture. Operculum (not always present) corneous, annular, the nucleus apical, or subcentral and nearly marginal.

In no other group of molluscs is it so difficult to make a satisfactory classification as in the *Turritidæ*. The forms are exceedingly numerous, and known in many species to be very variable in their characters, whilst the material for the recognition of most of those described is generally scanty. Living specimens are found in all seas.

The family as a whole is not of very great antiquity, its main features having been carved out in the Eocene, whilst many of its broad characteristics were not evolved until the Miocene or early Pliocene.

Subfam. 1. TURRITINÆ.

Operculum oval, with terminal nucleus.

KEY TO GENERA.

A. Sinus at the angle of the last whorl; canal moderate or long .. TURRIS.
B. Sinus at the shoulder of the last whorl; canal short, sinuate at the base.. .. .. DRILLIA.
C. Sinus contiguous with the suture; base of canal not sinuate .. SPIROTROPIS.
D. Sinus very faint; canal very short, not sinuate .. .. BELA.

Genus 1. TURRIS, Bolten, 1798.

Turris, Bolten, Mus. Bolten. (2), 1798, 123. Type: *Murex babylonius*, L. *Murex* (sp.), Linné, 1758. *Fusus* (in part), Helbling, 1779. *Pleurotoma*, Lamarck, 1799.

Animal having the foot truncated anteriorly, obtuse posteriorly; tentacles cylindrical, with eyes externally near their base; teeth of radula falciform, angulated, formula 1 + 0 + 1. Radula of *Turris babylonia*, L.: Atlas, pl. 1, f. 4.

Shell turriculated, fusiform; spire long, sharp; protoconch conic, the nucleus obtuse; whorls angled, generally crenulated upon the angle or adorned with spiral cords; aperture ovate, the columellar margin smooth; the outer lip with a narrow profound sinus, situate at the angle of the whorl, separated rather distantly from the suture.

Inhabiting warm seas.

Subgen. 1. HEMIPLEUROTOMA, Cossmann, 1889.

Type: *Pleurotoma denticula*, Basterot. *Coronia*, de Greg., 1890 (in part).

Shell turriculated, nodulous; spire high, conic; protoconch the same as in the genus; whorls usually crenulated, excavated above, with a cord or smooth carina toward the suture; the last whorl with a sinuous base and a rather short nearly straight canal; aperture pyriform, suddenly contracted towards the canal; outer lip strongly convex, with a somewhat rectangular sinus at the row of nodules; inner lip thin and very little callous.

KEY TO SPECIES.

A. Shell with prominent spiral ribs, 5 on the penultimate whorl, crossed by growth-lines .. .. *alticincta.*
B. Shell with but little sculpture; the whorls with 2 keels, one above the middle and one above the suture; strong growth-lines .. *ischna.*

1. Turris alticincta, Murdoch and Suter, 1906. Plate 21, fig. 1.

Pleurotoma (*Hemipleurotoma*) *alticincta*, M. & S., T.N.Z.I., xxxviii, 1905 (1906), 285, pl. 22, f. 12, 13.

Shell rather small, turriculate, subcylindrical, with a long spire, deeply sulcate whorls, an oblong aperture which is slightly shorter than the spire, and a short canal. *Sculpture:* On the upper spire-whorls a few minute spiral striæ, the next with 4 distinct cinguli, on the succeeding a minute fifth spiral arises at the suture, which on the penultimate strengthens and about equals the adjoining revolving ribs; the cinguli are strong, rounded, and adorned with minute spiral threadlets, absent in the grooves; the latter are deep, somewhat

square-cut, and narrower than the ribs; the last whorl with 10 ribs and a number of minute threadlets upon the back of the canal, added to which are the oblique lines of old beaks; grooves and ribs subequal, but the former sometimes broader as they proceed anteriorly. The growth-striæ are minute, slightly irregular in strength, and giving in places (usually upon the upper whorls of the spire) a slightly clathrate appearance. *Colour* of fresh specimens light horn, dead shells greyish-white. *Spire* high, gradate, turriculate, with an obtuse rounded apex, a little higher than the aperture with canal. *Protoconch* of about 2 convex turns, slopingly shouldered, with minute spirals, the precursors of the adult sculpture; nucleus central, depressed globular, smooth. *Whorls* 7, flattened, strongly shouldered at the suture, first slowly then more rapidly increasing. *Suture* deep, margined above on the lower whorls. *Aperture* elongate, somewhat narrow, slightly contracted in front and forming a short open canal, which is truncated and slightly sinuate at the base, bent backward and a little to the left. *Outer lip* slightly thickened, descending with a light downward sweep, crenulate at the margin; the sinus indistinct, situated on the upper cingulum. *Columella* excavated in the middle, drawn out to a point on approaching the anterior beak. *Inner lip* forming a broad callus, through which on the parietal wall the 3 cinguli appear as folds, with a distinct edge, which is slightly raised, connected above with the outer lip.

Diameter, 5·75 mm.; height, 15·7 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms.

Remark.—This species is in its sculpture nearly allied to *T. septemlirata* and *trilirata*, Harris, from the Eocene of Australia.

2. Turris ischna, Watson, 1881. Plate 21, fig. 2.

Pleurotoma ischna, Watson, J.L.S., xv, 1881, 403; Chall. Rep., xv, 280, pl. 22, f. 2; P.L.S. N.S.W., x, 116; T.N.Z.I., xxxi, 65; Index, 70.

Shell high, narrow, conical, blunt, with a contracted base and longish canal, little sculpture, strongish, yellowish-grey, porcellanous. *Sculpture:* Longitudinals—there are only strongish unequal lines of growth, which rise into small tubercles, especially on the upper whorls; between the stronger lines the surface of the shell is delicately fretted with other minute sharp lines. Spirals—the whorls are faintly keeled above the middle by a spiral thread, which is a little stronger and more prominent than any of the others; close above the suture is another almost as strong, and which also slightly carinates the whorls; halfway between these is a finer thread, which tends to split into 2 very fine threads; at the suture, but visible beyond the aperture, is another thread, which here defines the base. The longitudinals rise into very small tubercles as they cross the spirals; but this feature is much stronger on the upper whorls, which are reticulated; on the last whorl

it is feeble. Between the keel and the superior suture lie 3 very fine equally parted threads. On the base and neck of the canal are about 12 pretty equal fine threads. *Colour* a faintly yellowish-grey. *Epidermis* extremely thin, smooth. *Spire* conical, with an almost unbroken profile, the whorls being scarcely convex. *Protoconch* of barely 2 whorls, smooth, globose, not flattened down at the tip, which, however, is slightly immersed. *Whorls* 7, feebly keeled, with a just perceptibly concave line from the suture to the keel, and from the keel to the suture below. Just above the suture there is a slight contraction, which forms a faint superior margination. The last whorl is very slightly swollen; the base is rather rapidly contracted, and is drawn out into a rather long, straight, but not narrow canal. *Suture* distinct, impressed. *Aperture* almost club-shaped, being pointedly oval above, with a longish rather sinuous canal below. *Outer lip* forms a regular curve, till at the canal it becomes flattened and oblique; from the body it retreats at once to form the rather deep rounded open-mouthed sinus, from which it advances on a very straight line to the edge of the canal in front, where it bends slowly and slightly backwards; it is throughout open, but not patulous except at the point of the canal. *Inner lip* spreads as a narrow porcellanous glaze on the body and pillar; it is slightly hollowed out on the body, is straight on the pillar, toward the front of which it is cut off with a narrow rounded and very slightly oblique edge. (Watson.)

Diameter, 2·25 mm.; height, 8·5 mm.

Animal unknown.

Type in the British Museum.

Hab.—East of East Cape, in 700 fathoms ("Challenger").

Subgen. 2. Leucosyrinx, Dall, 1889.

Leucosyrinx, Dall, Bull. Mus. Comp. Zool., xvii, 1889, 75. Type: *Pleurotoma Verrillii*, Dall.

Shell white or pale without colour pattern, thin, the anal notch behind the periphery or at the suture; sculpture delicate, of spiral keels or threads, and often oblique riblets on the shoulder of the whorls; peripheral keel, if present, not recurved. Operculum thin, nucleus apical, scar of attachment small.

Larval shell glossy, rounded or keeled; other shell-characters as in *Turris*.

This group is intended to contain the operculated species of *Turris* (in its widest sense), which are so characteristic of the archibenthal region. They are distinctly contrasted with the coarse, spotted or maculated shallow-water species of *Turris* proper by their thin, white, delicately sculptured shells. The anal notch is generally wide, more rounded, and nearer the suture than in typical *Turris*, and the operculum proportionally wider and more delicate.

All species from deep or comparatively deep water.

Key to Species.

A. Whorls strongly keeled, keel ornamented with oblique gemmules; axial sculpture consisting of growth-lines only .. .. *augusta.*
B. Whorls shouldered, with axial and spiral threads and riblets .. *eremita.*

3. Turris augusta, Murdoch and Suter, 1906. Plate 21, fig. 3.

Pleurotoma (*Leucosyrinx*) *augusta*, M. & S., T.N.Z.I., xxxviii, 1905 (1906), 286, pl. 22, f. 14–17.

Shell fusiform, slender, fragile, spire and aperture of about the same height, whorls with a spiral keel bearing small nodules, canal long. *Sculpture:* The whorls are strongly keeled at the periphery and with a row of gemmules set slightly oblique thereon; on the last whorl there is a lower smooth keel present; a few inconspicuous spiral striæ are on the area between the keels and on the anterior extremity; the axial sculpture consists of minute and irregular growth-lines only. *Colour* pure-white, slightly shining. *Spire* pagodiform, elongated. *Protoconch* smooth and shining, consisting of about 2 turns; the nucleus is slightly tilted, and with a distinctly marked smooth carina, which is much strengthened on the succeeding whorl. *Whorls* 7, regularly and rather slowly increasing, the last biangulate, concave below the keels, and produced into a rather long, narrow, and truncated beak. *Suture* deep, minutely bimarginate. *Aperture* angularly ovate, broadly angled above, contracted below, and terminating in a rather long open canal, which is somewhat turned to the left. The *outer lip* is biangled and concave above, between, and below the angles; sinus broad and moderately deep, extending almost from the suture to the keel. *Columella* nearly straight and slightly twisted, ending in a fine point on the left margin of the canal. The *inner lip* spreads as a very thin narrow callus over the concave parietal wall and the columella.

Diameter, 3·9 mm.; height, 10·3 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms.

Remark.—The species is allied to *T. alta*, Harris (= *pagoda*, Hutton, not of Reeve), from which, however, it may be distinguished by the gemmules on the keel and the distinct carina on the protoconch, both of which characters are absent in the Tertiary fossil.

4. Turris eremita, Murdoch and Suter, 1906. Plate 21, fig. 4.

Pleurotoma (*Leucosyrinx*) *eremita*, M. & S., T.N.Z.I., xxxviii, 1905 (1906), 287, pl. 22, f. 18, 19.

Shell small, fusiform, fragile, with shouldered whorls, the aperture but slightly shorter than the spire, and a rather short open canal. The *sculpture* consists of axial and spiral threads and riblets, the former inclined slightly backward; the axial threads number about 15 on the penultimate whorl and are obsolete above the angle, absent upon the greater part of the last whorl. The spirals consist of 5 minute threads

on the slope above the angle; beneath the latter there are 4 much stronger riblets, forming gemmules at the intersection of the axials; the last whorl with about 23 spirals, those upon the base and neck more widely spaced but equally slender as those on the shoulder. *Colour* light cream. *Spire* turriculate-conical, with a blunt apex. *Protoconch* slightly bulbose, with about 2 smooth whorls, the nucleus globular. *Whorls* 5, angled at the periphery, straight above, slightly convex below; base convex, then contracted, and ending in a short, distally rounded beak. *Suture* deep. *Aperture* pyriform, broadly angled above, ending in a rather short almost straight canal, slightly turned to the left. *Outer lip* convex above, contracted near the base; the sinus broad, rounded, and moderately deep, extending almost from the suture to the keel. *Columella* almost straight, slightly twisted at the base. *Inner lip* forming a thin and narrow callosity.

Diameter, 2·4 mm.; height, 5·8 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms.

Remark.—In sculpture this species is allied to *T. ischna*, but the spiral riblets are much more numerous.

Genus 2. Drillia, Gray, 1838.

Drillia, Gray, A.M.N.H., 1838, 28. Type: *Pleurotoma umbilicata*, Gray.
Moniliopsis, Conrad, 1865.

Animal with tentacles approaching at their bases and eyes near their extremities.

Shell having a short canal; outer lip subvaricose, the sinus between the suture and the angle of the body-whorl.

Inhabiting warm seas.

Fossil in the Cretaceous and Tertiary.

Key to Subgenera.

A. Spire turriculate, canal recurved .. .. .. Drillia, s. str.
B. Canal truncated.
  a. Axial costæ discontinuous over the whorls .. .. Crassispira.
  b. Axial costæ continuous over the whorls .. .. Cymatosyrinx.

Subgen. 1. Drillia, s. str.

Shell narrowly fusiform; spire high and turriculate; protoconch smooth, polygyrate, conoid, with the nucleus obtuse; whorls convex below, where they are ornamented with riblets or oblique nodules, with a spiral depression above, followed by a more or less conspicuous spiral ridge close to the suture; spire higher than the aperture; last whorl rounded, with an obsolete basal fasciole; aperture pyriform, channelled above, not much contracted below, with a short wide canal, oblique and slightly turned to the left; outer lip moderately

convex, thickened or varicose, with a moderately deep sinus at the depression of the shoulder; columella straight, callous; very often a small swelling on the parietal wall near the channel.

KEY TO SPECIES.

A. Height of spire equals about that of the aperture with canal.
  a. Shell without axial sculpture. Whorls with a smooth upper and a gemmate lower keel; protoconch smooth; spire little higher than the aperture with canal .. .. .. *multiplex.*
  aa. Shell with axial sculpture.
    b. Axial riblets about 15 on a whorl, crossed by 6–7 spiral liræ on the penultimate whorl; suture bimarginate .. .. .. *Buchanani maorum.*
    bb. Axial riblets about 9, nodulous, with 1 spiral thread below the suture, and 2–3 spirals, crossing the riblets, further down; suture margined below .. .. .. *verrucosa.*
B. Spire about 1½ times the height of the aperture with canal.
  a. Whorls with about 5 nodulous spirals and about 20 oblique axial riblets .. .. .. *novæ-zelandiæ.*
  aa. Whorls with about 15 very strong oblique axial ribs, crossed by a few spiral ridges .. .. *Trailli.*
C. Spire about twice the height of the aperture with canal.
  a. Whorls with about 14 median nodules, incised on the lower whorls by a median spiral groove; protoconch spirally striate, the second whorl with a keel .. .. *chordata.*
  aa. Whorls with about 21 axial riblets and 3 spiral liræ on the spire-whorls, points of intersection beaded; protoconch smooth .. .. *optabilis.*

1. Drillia Buchanani, Hutton, subsp. maorum, E. A. Smith, 1877. Plate 46, fig. 22.

Drillia (?) *maorum*, E. A. Smith, A.M.N.H. (4), xix, 1877, 497. *D. Buchanani*, subsp. *maorum*, Suter, J. Mal., xii, 73; Murdoch and Suter, T.N.Z.I., xxxviii, 282. *Surcula Buchanani*, subsp. *maorum*, Smith: Suter, P. Mal. S., vi, 200. *Drillia Buchanani*, Hutton, J. de Conch., xxvi, 16; M.N.Z.M., 42, not of Cat. Tert. Moll. *Pleurotoma Buchanani*, Hutton, Man. Conch. (1), vi, 208; not of Cat. Tert. Moll. *Drillia maorum*, Smith, M.N.Z.M., 44; P.L.S. N.S.W., x, 116. *Surcula Trailli*, Hutton: Suter, T.N.Z.I., xxxi, 90; xxxiv, 211: Index, 71; not of Hutton.

Shell fusiform, turreted, axially obliquely costate and spirally striate, fulvous. *Sculpture* consisting of crowded obsolete axial ribs, rather oblique above at the excavation, where they vanish, about 15 on a whorl, not continued over the base; they are crossed by spiral liræ, 6 to 7 on the penultimate whorl, about 15 on the body-whorl, the interstices now and again with one or two fine spiral threads; the liræ are inequidistant and of variable strength; a fine spiral thread below the suture, the excavated shoulder smooth except for crescent-shaped growth-lines. *Colour* fulvous; aperture inside of the same

colour. *Spire* high, turriculate, sharply pointed, but little higher than the aperture with canal. *Protoconch* of 2 convex whorls, the second finely spirally striate. *Whorls* 8½, with a slightly excavated shoulder, flatly rounded below, base somewhat contracted. *Suture* impressed, bimarginate. *Aperture* elongated, subchannelled above, produced below into a subelongated narrow channel, slightly recurved and turned to the left, base but faintly sinuated. *Outer lip* convex, lightly contracted below, with a moderate sinus situated in the excavation. *Columella* straight, turned to the left below. *Inner lip* thin and narrow, spreading over the lightly concave parietal wall. *Operculum* not seen.

Diameter, 6·5 mm.; height, 21 mm. (type): angle of spire, 29°. Diameter, 2·8 mm.; height, 7 mm. (specimen from Flat Point).

Animal unknown.

Type in the British Museum.

Hab.—Throughout New Zealand: Auckland Harbour; near Channel Island, Hauraki Gulf, in 25 fathoms; off Great Barrier Island, in 110 fathoms; Flat Point, east coast of North Island, in 75 fathoms; dredged off Otago Heads (A. Hamilton); Foveaux Strait, in 15 fathoms; near Cuvier Island, in 38 fathoms (Captain Bollons).

Remarks.—The size of the shell is extremely variable, as may be guessed from the measurements of extreme forms indicated. The sculpture also shows a great deal of variability; the axial costæ are sometimes very faint, but often strong, especially in specimens from the south; the spiral liræ are varying in number and strength. Examples from deep water are usually white or yellowish-white; fresh shells, however, may be of a darker colour.

2. **Drillia chordata**, Suter, 1908. Plate 21, figs. 5, 5*a*.

Drillia chordata, Suter, P. Mal. S., viii, 1908, 184, pl. 7, f. 16.

Shell small, fusiform, fairly solid, whitish, suture strongly margined, whorls angulated by a row of large nodules, spire high, anal sinus moderately deep. *Sculpture* consisting of a row of large oval nodules on the middle of the whorls, about 14 on a whorl, those on the last two whorls somewhat stretched out towards the suture below, and incised in the middle by a spiral linear groove; a very strong spiral cord margins the suture below, and a fine thread above; the latter is continued as a rather strong cord on the body-whorl, and is succeeded below by a similar cord; the base of the body-whorl is adorned with fine spiral threads, close together upon the beak; the whole sculpture crossed by very fine, strongly flexuous, and oblique growth-lines. *Colour* whitish. *Spire* high, conic, somewhat less than twice the height of the aperture. *Protoconch* of 2 whorls, which are microscopically spirally striate, the nucleus oblique, rounded, the

second volution with a sharp median keel. *Whorls* 7, regularly increasing, roundly angled at the middle by the nodules, concave above and below it; body-whorl slightly convex, contracted at the base. *Suture* linear, bimarginate. *Aperture* oblique, oval, angled above, produced below into an oblique short and open canal, slightly notched at its base. *Outer lip* sharp, somewhat strengthened on the outside, moderately convex, contracted below, with a fairly deep and rounded sinus in the depression above the row of nodules. *Columella* slightly arcuate, excavated on meeting the parietal wall. *Inner lip* thin and narrow, drawn out to a point towards the margin of the canal. *Operculum* unknown.

Diameter, 3·9 mm.; height, 9 mm.

Animal unknown.

Type in my collection.

Hab.—Dredged off Otago Heads (A. Hamilton).

Remark.—Allied to *D. wanganuiensis*, Hutt., from the Pliocene, by the very strong sutural cord.

3. **Drillia multiplex**, Webster, 1906. Plate 21, fig. 6.

Drillia multiplex, Webster, T.N.Z.I., xxxviii, 1905 (1906), 306, pl. 38, f. 3.

Shell fusiform, white and chalky. *Sculpture:* Each whorl is tabulated below the suture, and the tabulation ends anteriorly in a prominent spiral thread; then follows a second tabulation, terminating in a row of oval gemmules, about 15 on the last whorl; just posterior to the gemmules is a fine spiral thread carrying the abruptly curved sharp threads of the anal sinus: these threads are regularly interspaced, elevated, and very distinct on both tabulations; they are covered by the first spiral, but override the second with a sharp downward bend; on the body-whorl they change their character, becoming mere striations, and more numerous than in the fasciole of the anal sinus. A second slightly gemmed thread appears on the body-whorl, and 2 fine spiral lines on the anterior tabulation; on the base are 4 strong spirals, and on the canal about 10 much weaker. *Colour* white; fresh specimens are pale pink. *Spire* conic, very little higher than the aperture. *Protoconch* of $1\frac{1}{4}$ whorls, glossy. *Whorls* 5, tabulated, convex, the base contracted. *Aperture* pyriform, with a short narrow and straight canal below. *Outer lip* broken off. *Columella* straight, drawn out to a fine point below. *Inner lip* narrow, spreading over the nearly straight parietal wall. *Operculum* unknown.

Diameter, 2·5 mm.; height, 5·5 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms (type); off the Poor Knights, in 70 fathoms (C. Cooper).

4. Drillia novæ-zelandiæ, Reeve, 1843. Plate 46, fig. 23.

Pleurotoma novæ-zelandiæ, Reeve, Conch. Icon., 1843, f. 143. *Drillia novæ-zelandiæ*, Hutton, C.M.M., 11; J. de Conch., xxvi, 16; M.N.Z.M., 43; P.L.S. N.S.W., x, 117; Tryon, Man. Conch. (1), vi, 184, pl. 12, f. 42, 44; Suter, J. Mal., xii, 73. *Surcula novæ-zelandiæ*, Reeve: Suter, T.N.Z.I., xxxi, 67; Index, 70. *Pleurotoma rosea*, Quoy and Gaimard, Voy. Astrol., ii, 1833, 524, pl. 35, f. 10, 11; Dieff. N.Z., 230; Crit. List, 17, not of Sowerby. *P. Quoyi*, Deshayes, A.s.V., ed. 2, ix, 346; not of Desmoulins.

Shell fusiform, with a high and acute spire, fairly solid, light-pinkish, spirally and axially ribbed. *Sculpture* consisting of a spiral rib below the suture, usually ornamented by a few spiral threads, followed by a narrow depression with a few spiral threads, the lower two-thirds of the spire-whorls with about 5 unequal spiral ribs, continued on the body-whorl over the whole of the base, but much finer and closer on the neck of the canal; all the spiral ribs are crossed by oblique, more or less undulating axial costæ, about 20 on a whorl, the points of intersection raised to roundish or elongate nodules, mostly obsolete on the lower part of the base. *Colour* pinkish-grey, purple-rose within the aperture. *Spire* turriculate, high and acuminate, sharply pointed, the height about $1\frac{1}{2}$ times that of the aperture. *Protoconch* of 2 smooth and convex whorls. *Whorls* about 10, first slowly then more rapidly increasing, lightly biangulate; the body-whorl convex at the periphery, contracted below. *Suture* distinct, margined above by a narrow thread, below by the broad nodulous spiral rib. *Aperture* pyriform, lightly channelled above, produced below into a short and open canal, slightly turned to the left and backwards, notched at the base. *Outer lip* convex, contracted below, thin and sharp, with a narrow and not very deep sinus at the spiral depression of the whorl. *Columella* subvertical, slightly convex at the middle, turned to the left below. *Inner lip* not very broad, smooth, distinctly bounded on the outer side, narrowed below and forming the left margin of the canal, extending above over the lightly concave parietal wall, which usually bears a callous ridge below the angle of the aperture. *Basal fasciole* inconspicuous. *Operculum* with the nucleus apical.

Diameter, 10 mm.; height, 28 mm. Angle of spire, 25°.

Animal unknown.

Type in the British Museum.

Hab.—Throughout New Zealand, but nowhere common, in depths to about 30 fathoms; Off Wanganui, dredged; sandy beach at Takapuna, washed up after gales; Wellington Harbour. Chatham Islands.

Remarks.—The sculpture is subject to a considerable amount of variation. The Pliocene *D. plicatella*, Hutton, is a very nearly allied species.

Fossil in the Pliocene.

5. **Drillia optabilis,** Murdoch and Suter, 1906. Plate 21, fig. 7.

Drillia optabilis, M. & S., T.N.Z.I., xxxviii, 1905 (1906), 283, pl. 21, f. 9.

Shell small, narrow, turriculate, last whorl shorter than the spire, clathrate, aperture pyriform, canal short. *Sculpture:* On the spire-whorls 3 spiral equidistant cords, which are crossed by axial also equidistant threads, forming small beads at the intersections, and squarish interstitial depressions; there are about 21 beads on a row; on approaching the base the spirals are getting narrower than the interspaces and the beading less prominent; upon the beak there are small irregular threads crossed obliquely by the plications of the fasciole. *Colour* greyish-white. *Spire* turriculate, not very conspicuously shouldered, the height nearly twice that of the aperture. *Protoconch* with a globular and obliquely tilted nucleus. *Whorls* 7, narrowly angled and excavated above, sides almost straight; base convex and narrowed to a short and anteriorly sinuated beak. *Suture* bimarginate, above by a minute threadlet, below by a broad and heavy cord which is obliquely irregularly plicated. *Aperture* pyriform, angled above, with a concave inner wall, ending in a short broad canal, which turns slightly to the left. *Outer lip* curved, imperfect; the lines of growth would indicate that the sinus is situate in the excavations below the sutural cord, that it is small and moderately deep. *Columella* at first straight and then slightly twisted to the left, ending in a sharp point. *Inner lip* rather broad on the columella, spread as a thin layer over the parietal wall. *Operculum* unknown.

Diameter, 3·9 mm.; height, 10·7 mm. Angle of spire, 22°.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms.

6. **Drillia Trailli,** Hutton, 1873. Plate 46, fig. 24.

Pleurotoma Trailli, Hutton, C.M.M., 11; M.N.Z.M., 42. *Drillia Trailli,* Hutt., Man. Conch (1), vi, 206, pl. 34, f. 90; pl. 12, f. 37. *Surcula Trailli,* Hutt.: Suter, T.N.Z.I., xxxi, 90; xxxiv, 211: Index, 71: P. Mal. S., vi, 201. *Drillia æmula,* Angas, P.Z.S., 1877, 36, pl. 5, f. 9; M.N.Z.M., 44. *D. bætica,* Reeve: Hutton, J. de Conch., xxvi, 16; not of Reeve. *Drillia* (?) *maorum,* E. A. Smith: Hutton, P.L.S. N.S.W., x, 116; not of E. A. Smith.

Shell fusiform, turriculate, fairly solid, axially costate and the suture strongly marginate, brown. *Sculpture* consisting of slightly oblique, distant, broadly rounded axial costæ, about 15 on a whorl not extending over the base on the last whorl; below the suture there is a distinct spiral ridge, margining it, the space to the angle of the whorls is smooth, save crescent-shaped growth-lines; from the angle to the suture below the axial ribs are crossed by a number of spiral ridges, rendering them somewhat nodulous; the whole of the base is spirally ridged, the ridges closer and finer upon the neck of the canal.

Colour purplish-brown; inside of aperture brownish. *Spire* acute, high, turriculate, about 1½ times the height of the aperture with canal. *Protoconch* of 2 smooth convex whorls. *Whorls* about 10, narrowly shouldered, convex below the angle of the shoulder; base contracted. *Suture* bimarginate, not deep. *Aperture* pyriform, lightly channelled above, produced below into a short widely open and somewhat recurved canal, notched at its base. *Outer lip* convex, slightly contracted below, fairly strong, sharp, crenulated by the spiral sculpture, the sinus situated at the shoulder of the whorl, narrow and moderately deep. *Columella* subvertical, lightly convex at the middle, oblique below. *Inner lip* smooth, narrow, drawn out to a fine point towards the left margin of the canal, very thin upon the lightly excavated parietal wall. *Operculum* small, oval, both ends sharply rounded, the nucleus apical.

Diameter, 10·25 mm.; height, 28 mm. Angle of spire, 28°.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Stewart Island, 24 fathoms. Also coasts of New South Wales.

Fossil in the Miocene.

7. **Drillia verrucosa**, Suter, 1899. Plate 21, fig. 8.

Surcula verrucosa, Sut., T.N.Z.I., xxxi, 1898 (1899), 70, pl. 3, f. 1. *Drillia verrucosa*, Suter, J. Mal., xii, 73.

Shell fusiform, turriculate, rather thin and fragile, with strong nodulous axial costæ, spirally lirate. *Sculpture* consisting of about 9 broadly convex nodulous axial ribs on a whorl, not extending over the depression of the shoulder, and vanishing entirely upon the base; a slight spiral thread margins the suture below, 2 to 3 spiral liræ cross the ribs on the spire-whorls, the base with strong spiral liræ, which are getting finer and more dense as they approach the neck of the canal. *Colour* yellowish-brown. *Spire* high, turreted, acuminate, its height very little more than that of the aperture with canal. *Protoconch* smooth, mammillary, of 1½ volutions. *Whorls* 7, with a narrow concave shoulder, flatly rounded below; base contracted. *Suture* lightly impressed, margined below. *Aperture* pyriform, lightly channelled above, produced below into a short narrow canal, somewhat recurved and turned to the left, not sinuate at the base. *Outer lip* convex, contracted below, thin and sharp or thickened and varicose by a rib, with a moderately broad shallow sinus in the depression of the shoulder. *Columella* slightly convex, turned to the left below. *Inner lip* not thick, narrow, spreading thinly over the excavated parietal wall. *Operculum* unknown.

Diameter, 4 mm.; height, 9·5 mm.

Animal unknown.

Type in my collection.

Hab.—Foveaux Strait, in 15 fathoms, type (A. Hamilton); Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons); near the Snares, in 50 fathoms (Captain Bollons).

Subgen. 2. Crassispira. Swainson, 1840.

Crassispira, Swainson, "Malacology," 1840, 152, 313. Type: *Pleurotoma Bottæ*, Val. *Tripia*, de Greg., 1890. *Crassopleura*, Monts., 1884.

Shell somewhat claviform, turriculated; spire conic or conoidal; protoconch paucispiral, obtuse; whorls with tuberculate or granulate ribs, stopped suddenly at the depression of the shoulder; body-whorl but moderately convex, with a slight swelling on the beak; aperture narrow, the margins subparallel, with a shortly truncated and distinctly emarginate canal; outer lip arcuate, generally varicose above, with a deep sinus in the depression, which is narrow and parallel with the suture; columella oblique, callous, with a thick callus on the parietal wall.

Key to Species.

A. Spire a little higher than the aperture with canal; whorls with 8–10 large oval tubercles on the shoulder .. .. .. *Angasi.*
B. Spire nearly twice the height of the aperture with canal; whorls with about 14 strong, oblique, rounded axial ribs .. .. *lævis.*

8. Drillia Angasi, Crosse, 1863. Plate 46, fig. 25.

Drillia Angasi, Crosse, J. de Conch. (3), iii, 1863, 87, pl. 1, f. 5; Man. Conch. (1), vi, 1884, 187, pl. 9, f. 37. *Pleurotoma Beraudiana*, Crosse, J. de Conch. (3), iii, 1863, 88, pl. 1, f. 6. *Drillia Beraudiana*, Crosse, Man. Conch. (1), vi, 187, pl. 9, f. 36. *Pleurotoma* (*Crassispira*) *Beraudiana*, Crosse, Conch. Cab., 1887, 95, pl. 20, f. 7, 9. *Drillia tæniata*, T.-Woods, P.R.S. Tas., 1879, 36.

Shell rather small, somewhat claviform, turriculated, with prominent tubercles and spiral liræ, dark brown, tubercles whitish, canal short. *Sculpture* of the post-nuclear whorls consisting of axial slightly oblique ribs, produced into rather large oval tubercles at the shoulder, about 8 to 10 on the penultimate whorl, becoming obsolete on the last half of the body-whorl; they are crossed by spiral liræ, fine and dense on the concave shoulder, which is devoid of axial ribs, stouter and more distinct below it. *Colour* chestnut-brown, with a whitish spiral band at the angle of the periphery, tubercles usually white; inside of aperture dark brown. *Spire* elevated conic, turreted, somewhat higher than the aperture. *Protoconch* of 1½ smooth and convex turns. *Whorls* about 8, with a narrow concave shoulder, the body-whorl convex at the periphery, contracted at the base. *Suture* impressed, somewhat uneven. *Aperture* narrow, angled above, with a short open and truncated canal below. *Outer lip* slightly varicose, angled above, with a moderately deep, narrowly rounded sinus in the depression. *Columella* subvertical, arcuate. *Inner lip* narrow, with a whitish thin callus. *Operculum* not seen.

Diameter, 6 mm.; height, 15 mm.

Animal unknown.
Type in the collection of Dr. H. Fischer, Paris (?).
Hab.—Bay of Islands (J. C. Anderson). Australia and Tasmania.

9. Drillia lævis, Hutton, 1873. Plate 46, fig. 26.

Pleurotoma lævis, Hutt., C.M.M., 12. *Drillia lævis*, Hutt., M.N.Z.M., 44: P.L.S. N.S.W., x, 117: Plioc. M., 51, pl. 7, f. 32: T.N.Z.I., xxxi, 66; xxxviii, 283: J. Mal., xii, 73.

Shell claviform, solid, axially costate, with a pinkish spiral band. *Sculpture* consisting of oblique rounded and strong axial ribs, beginning at the angle of the shoulder, and extending to the suture below; on the body-whorl they are obsolete on the base; their number is about 14 on a whorl; the whole surface, and especially the interstices, are very distinctly striated by fine flexuous growth-lines, crescent-shaped on the smooth depression of the shoulder; microscopic spiral lines are sometimes visible on the shoulder, and, a little stouter, upon the lower part of the base; the lightly elevated fasciole very finely transversely striated. *Colour* pale fulvous, usually with a broad spiral band of pink on the centre of the whorls. *Spire* high, acuminate, turreted, nearly twice the height of the aperture. *Protoconch* of 1½ smooth convex white whorls, the nucleus broadly rounded. *Whorls* about 8, regularly increasing, a little concave at the narrow shoulder, convex below it; body-whorl flatly rounded below the angle, but faintly contracted at the base. *Suture* distinct, not deep. *Aperture* oblique, narrowly ovate, produced below into a short straight and widely open canal, sinuated at the base. *Outer lip* convex, a little contracted below, thickened inside, with a rather deep and narrow sinus above, its margins thickly callous. *Columella* subvertical, drawn out to a fine point below. *Inner lip* smooth, broad, and thick, extending over the parietal wall, which has a prominent tubercle margining the sinus. *Operculum* unknown.

Diameter, 7 mm.; height, 18 mm. (type). Angle of spire, 30°.
Animal unknown.
Type in the Dominion Museum, Wellington.
Hab.—Stewart Island (type); Port Pegasus, in 18 fathoms (Captain Bollons); Foveaux Strait, in 15 fathoms; near Cuvier Island, in 37 fathoms (Captain Bollons); off Great Barrier Island, in 110 fathoms; near Channel Island, Hauraki Gulf, in 25 fathoms.
Fossil in the Pliocene.

Subsp. parva, Suter, 1908.

Drillia lævis parva, Suter, P. Mal. S., viii, 1908, 185.

Distinguished from the species by its much smaller size, the broader shoulder, and the slender, short, oblique costæ, sometimes reduced to pointed tubercles on the last whorl, their number being 12 to 14 on the last whorl.

Diameter, 3·5 mm. ; height, 8 mm.

Type in my collection.

Hab.—Near Cuvier Island, in 37 fathoms, type (Captain Bollons) ; Snares, in 50 fathoms (Captain Bollons) ; Stewart Island, in 18 fathoms (Captain Bollons).

Subgen. 3. Cymatosyrinx, Dall, 1889.

Cymatosyrinx, Dall, Bull. Mus. Comp. Zool., xviii, 95. Type : *Pleurotoma lunata*, Lea. *Clavus*, Montfort, 1810 ; not *Clava*, Gmelin, 1790.

Shell generally short and stout, the spire often very short ; whorls with nodulous axial ribs, extending over the whole of the volutions, generally without spiral sculpture, or, if present, very weak ; aperture subrhomboidal, very little narrowed below, with a short and broad canal ; outer lip arched, with a shallow sinus towards the suture ; inner lip large and callous.

10. Drillia lyallensis, Murdoch, 1905. Plate 21, fig. 9.

Drillia lyallensis, Murdoch, T.N.Z.I., xxxvii, 1904 (1905), 221, pl. 7, f. 7.

Shell small, fusiform, rather solid. *Sculpture* consisting of 11 to 12 low, strong, rounded, and slightly oblique axial ribs, rather wider than the interspaces, obsolete on the base and usually on approaching the outer lip ; spiral sculpture consists of minute striæ, erased upon the ribs, a few at the anterior end stronger, and frequently several rough irregular ridges on the basal fasciole. *Colour* light or dark brownish-red, or somewhat purple in somewhat beach-worn specimens. *Spire* conical, with a lightly turriculated appearance, somewhat higher than the aperture. *Protoconch* smooth, with a depressed nucleus. *Whorls* 6 to 6½, moderately convex, lightly contracted at the base. *Suture* somewhat deep and undulating. *Aperture* narrowly rhomboidal, subchannelled above, terminating in a short, broad, and slightly twisted canal, not emarginate below. *Outer lip* slightly thickened, flatly convex, and a little contracted towards the base, with shallow rounded sinus below the suture. *Columella* lightly curved, narrowed to a fine point at the left margin of the canal, excavated on meeting the convex parietal wall. *Inner lip* rather narrow, smooth, not very thick. *Operculum* unknown.

Diameter, 4·6 mm. ; height, 12 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Lyall Bay, type (C. Freyberg) ; Hauraki Gulf (H. S.) ; Bay of Islands.

Remark.—In sculpture the species most resembles *Manqilia Sinclairi*, E. A. Smith.

Genus 3. Spirotropis, Sars, 1878.

Spirotropis, Sars, Moll. Norv., 1878, 242. Type: *Pleurotoma bicarinata*, Bivona.

The teeth of the radula are very distinct, the formula being 1+1+1+1+1; the central tooth transverse, triangular, with a median and several denticles on each side, the lateral teeth long, subulate.

Shell turriculate, with a high and gradated spire; protoconch paucispiral, globular, the nucleus obtuse; whorls smooth, carinated at the middle, excavated above, the body-whorl convex, lightly contracted below; aperture pyriform, with a short wide canal, not emarginate at its base; outer lip arcuate, thin, with a rather broad and deep sinus near the suture; inner lip thin and narrow. Operculum normal.

Only a few species are known. The type occurs from the Mediterranean Sea to Norway, in deep water.

Fossil in the Miocene and Pliocene of Europe.

1. Spirotropis bulbacea, Watson, 1881. Plate 21, fig. 10.

Pleurotoma (*Drillia*) *bulbacea*, Wats., J.L.S., xv, 1881, 418. *Pleurotoma* (*Spirotropis*) *bulbacea*, Wats., Chall. Rep., xv, 325, pl. 25, f. 9. *Drillia bulbacea*, Wats.: Hutton, P.L.S. N.S.W., x, 116. *Spirotropis bulbacea*, Wats., Index, 70.

Shell broadish, conical, sharply keeled, strong, porcellanous, with a shortish contracted base, a short canal, short narrow ribs, spiral threads, and a bulbous apex. *Sculpture:* Axials—below the sinus-area arise ribs, slightly tubercled at the top, straight, narrow, and parted by shallow furrows about twice their breadth; they become feeble toward the lower suture; on the last whorl they do not continue to the base; there are 11 on the last two whorls; on the first infraembryonic whorl there are about 17, crowded, sharp, and oblique; the lines of growth are numerous and unequal, in the sinus-area they are sharp and delicate, on the rest of the shell coarse and puckered. Spirals—marginating the suture below as a narrow band; below this the sinus-area is very finely scratched, this is continued less distinctly on the rest of the surface. The projection of the top of the ribs forms a sharp keel. The rib-area is crossed by 5 coarsish threads, which rise into small tubercles on the ribs, 1 or 2 smaller threads come in between the lines of these spirals; they are also found on the base, though less distinct. *Colour* dull porcellanous-white. *Spire* rather short, conical, slightly scalar, about the same height as the aperture. *Protoconch* of 2 smooth convex whorls, with a deep suture. *Whorls* $6\frac{1}{2}$, short, rather rapidly increasing, concavely shouldered, slightly contracted towards the lower suture; base somewhat narrowed. *Suture* coarse, slightly impressed, margined below. *Aperture* narrowly oval, pointed above, with an oblique short rather open and gradually contracted canal below, not emarginate at its base. *Outer lip* depressed

convex, with a shallow blunt V-shaped sinus below the suture. *Columella* short and narrow, its point cut off with a very slight obliquity, the edge blunt and very slightly twisted. *Inner lip* narrow, porcellanous, running obliquely to the base. *Operculum* small, oval, smooth, with terminal apex, brownish-yellow. (Watson.)

Diameter, 5·75 mm. ; height, 13 mm.

Animal unknown.

Type in the British Museum.

Hab.—East of East Cape, in 700 fathoms (" Challenger ").

Genus 4. Bela, Leach, in Gray, 1847.

Bela, Leach, P.Z.S., 1847, 134. Neotype : *B. turricula*, Montg.

Shell fusiform or buccinoid ; spire more or less short, very often shouldered. Protoconch paucispiral, with perfectly rounded nucleus ; whorls convex or subangular, with curved costæ and spiral liræ ; aperture narrow, oval or subpyriform, terminated by a very short nearly straight and widely open canal, its end attenuated, rounded, not emarginate ; outer lip not very thick, sinuous, but very slightly notched above, opposite the curve of the ribs, antecurrent and tangent to the suture ; inner lip callous, smooth, moderately broad, narrowed and subcarinated towards the canal.

Distribution.—Chiefly in the northern seas.

Fossil in the Tertiary.

Key to Species.

A. Spire a little lower than the aperture with canal ; whorls with about 18 very oblique fine axial riblets ; protoconch striated *ula.*

B. Spire a little higher than the aperture with canal ; whorls with 9–10 low rounded axial ribs ; protoconch smooth .. .. *neozelanica.*

1. Bela neozelanica, Suter, 1908. Plate 21, fig. 11.

Bela neozelanica, Suter, P. Mal. S., viii, 1908, 185, pl. 7, f. 17.

Shell small, ovate, solid, slightly turriculate, with blunt axial ribs and spiral liræ, maculated with brown and white below the shoulder. *Sculpture* consisting of rather distant low rounded axial costæ, 9 to 10 on the body-whorl, extending on the spire-whorls from the angle to the suture below, but only over the periphery on the body-whorl ; they are crossed by subequal flat spiral liræ, fine on the shoulder, broad upon the base, separated by linear interstices. *Colour :* The protoconch is flavescent, the other spire-whorls yellowish or brownish-white, maculated with brown and white below the shoulder ; the ribs usually white, the interstices brown ; body-whorl light brown below the maculations on the periphery ; aperture fulvous inside. *Spire* conic, turriculate, very little higher than the aperture. *Protoconch* papillate, of 2 smooth convex whorls. *Whorls* 6, the last high in proportion, with a sloping broad and lightly excavated shoulder, slightly

convex below the inconspicuous angle; body-whorl convex, but faintly contracted at the base. *Suture* distinct, but little impressed. *Aperture* lightly oblique, elongately oval, angled above, with a rudimentary broad and truncated canal below. *Outer lip* convex, rather thin and sharp, smooth inside, with a very slight broad sinus below the suture. *Columella* vertical, excavated toward the parietal wall, slightly turned to the left below. *Inner lip* narrow, thin, spreading over the convex parietal wall, tapering to a fine point below, and extending to the base of the canal. *Operculum* very small, length 2·1 mm., oval, the nucleus apical.

Diameter, 4·8 mm.; height, 10 mm.

Animal unknown.

Type in my collection.

Hab.—Whangarei Heads, in 3 to 4 fathoms (C. Cooper).

2. **Bela ula,** Watson, 1881. Plate 21, fig. 12.

Pleurotoma (*Drillia*) *ula,* Wats., J.L.S., xv, 1881, 420. *Mangilia ula,* Suter, T.N.Z.I., xxxi, 71; J. Mal., xii, 73. *Drillia ula,* Wats.: Hutton, P.L.S. N.S.W., x, 117. *Pleurotoma* (*Bela*) *ula,* Watson, Chall. Rep., xv, 312, pl. 22, f. 1.

Shell small, fusiform, biconical, angulated, obsoletely ribbed and spirally striate, canal short. *Sculpture* consisting of about 18 axial, very oblique, rather obsolete riblets, parted by wider shallow furrows; they are strongest and somewhat mucronate at the angulation, extending over the base, but not over the beak. There are many fine hair-like growth-lines. The spirals—there are a great many remote fine threads, finer and closer on the shoulder than on the body-whorl; those at the carination are strong, ornamented with minute granules, which swell into small tubercles in crossing the riblets. The interstices of the ribs and spirals are microscopically granulated. *Colour* semi-transparent, flinty, white, with a crisp aspect. *Spire* scalar, conoidal. *Protoconch* of 2 globose whorls, the nucleus immersed; they are remotely microscopically regularly striated. *Whorls* $5\frac{1}{2}$, slowly increasing, with a long sloping shoulder and a sharp carinated angle, below which they are cylindrical, slightly contracted at the suture; base convexly contracted to the short broad canal. *Suture* linear, well marked by the contraction of the whorls. *Aperture* rather large, pyriform, with 3 angles above and a wide open canal below. *Outer lip* thin, angulated, rectilinear above the angle, flatly curved below; sinus shallow, rounded. *Columella* short and straight. *Inner lip* thin and narrow. (Watson.)

Diameter, 3 mm.; height, 6 mm.

Animal unknown.

Type in the British Museum.

Hab.—East of East Cape, in 700 fathoms (" Challenger ").

Remark.—The shell is very likely immature (Watson).

Subfam. 2. CLAVATULINÆ.

Operculum pyriform, with lateral internal nucleus.

Genus 1. SURCULA, H. and A. Adams, 1853.

Surcula, H. & A. Ad., Ad. G.R.M., i, 1853, 88. Type: *Pleurotoma javana*, L.

Animal with the eyes at the base of the tentacles. Formula of teeth of radula 1+0+1; the teeth falciform.

Shell elongated, fusiform or biconic; spire turriculated; protoconch smooth, conic, with a pointed nucleus; whorls excavated above, convex below, very often ribbed on the convex part and angular or subcarinate below the shoulder; suture margined by a smooth cord; aperture pyriform, with an inflected and anteriorly widened canal, sometimes straight and narrow; outer lip thin, smooth inside, convex at the middle, with a deep sinus in the infrasutural depression above the peripheral carina; inner lip generally thin, narrow, ending in a fine point below.

Distribution.—Warm eastern seas, chiefly the Indian Ocean.

Fossil in the Tertiary.

1. Surcula gypsata, Watson, 1881. Plate 21, fig. 13.

Pleurotoma (*Drillia*) *gypsata*, Wats., J.L.S., xv, 1881, 413. *Drillia gypsata*, Wats.: Hutton, P.L.S. N.S.W., x, 117. *Pleurotoma* (*Surcula*) *gypsata*, Wats., Chall. Rep., xv, 297, pl. 25, f. 1.

Shell strong, fusiform, biconical, scalar, shortly sharply and obliquely ribbed, keeled, constricted at the suture, with a long and rather inflated body-whorl and a longish canal. *Sculpture:* Longitudinals—on each whorl is a strongish angulation, forming a shoulder, crowned by a series of narrow elongated tubercles or short ribs; this coronated keel lies on the earlier whorls below, but on the later above the middle; the ribs do not reach the lower suture; they are irregular in shape, swollen in the middle, the interstices nearly double their width; on the body-whorl they extend very little below the shoulder, and their number is about 20, but on the spire-whorls only 15; the surface is covered with hair-like lines of growth. Spirals—the whole surface is covered with flatly rounded threads, roughened by the incremental lines. *Colour* whitish under a yellowish epidermis, which is a rough but thin and persistent membrane. *Spire* high, scalar, conical. *Apex* eroded, but evidently small. *Whorls* about 10, of rather rapid increase, high, angulated, with a long scarcely concave shoulder, slightly contracted at the lower suture; the last large in proportion. *Suture* very slight. *Aperture* pale-buff-coloured within, long and narrow, angulated above, with an elongated broad unequal-sided canal. *Outer lip* slightly concave above, regularly curved from the keel to the base. On leaving the body the line of the edge runs straight forward for a short distance, and then curves round to the left, running

out on the line of the ribs into a high-shouldered prominent wing, between which and the body-whorl the broad deep and rounded sinus lies; toward the front of the mouth it retreats rapidly to the point of the canal. *Columella* long, straight, narrow, slightly twisted below. *Inner lip* rather broad, a little thickened, with a slightly raised edge. *Operculum* unknown. (Watson.)

Diameter, 19 mm.; height, 44·5 mm.

Animal unknown.

Type in the British Museum.

Hab.—East of East Cape, in 700 fathoms ("Challenger"). East Africa, near Dar-es-Salam, in 2,559 metres ("Valdivia").

Subfam. 3. BORSONINÆ.

Columella plicate or subplicate. Operculum with the nucleus subapical (in *Bathytoma Cheesemani*).

Key to Genera.

A. Shell mitriform; sinus broad and not deep, near the suture; columella generally with 2 plaits .. .. .. MITROMORPHA.
B. Shell oval, ventricose; sinus distant from the suture, deep; columella subplicate or wrinkled .. .. .. BATHYTOMA.

Genus 1. MITROMORPHA, A. Adams, 1865.

Mitromorpha, A. Adams, A.M.N.H. (3), xv, 1865, 322. Type: *M. lirata*, A. Ad.

Shell small, somewhat elongate and biconic, with revolving liræ and sometimes axially plicate; nucleus globose; outer lip scarcely or not at all notched above, often denticulate inside; columella nearly straight, generally having faint vestiges of oblique plaits, which do not extend far into the shell.

Distribution.—Japan, California, Barbadoes, Porto Rico, Australasia.

Fossil in the Pliocene of France.

Key to Species.

A. Shell with axial sculpture. Whorls with about 18 axial riblets, crossed by equidistant spiral cords, intersections gemmate .. *gemmata.*
B. Shell with fine spiral liræ only.
a. Spire of the same height as the aperture with canal; whorls shouldered; protoconch spirally striate. Height about 16 mm. .. .. *striata.*
aa. Spire about 1½ times the height of the aperture and canal; whorls not shouldered; protoconch smooth. Height about 5·5 mm. .. .. *substriata.*

1. Mitromorpha gemmata, Suter, 1908. Plate 21, fig. 14.

Mitromorpha gemmata, Suter, P. Mal. S., viii, 1908, 186, pl. 7, f. 18.

Shell small, ovate, thin and fragile, semitransparent, axially costate and spirally striate, the crossing-points gemmate. *Sculpture:* All the whorls below the smooth protoconch are axially equidistantly

and closely costate, about 18 on the last whorl, the interstices narrow; towards the base the riblets are getting obsolete; they are crossed by equidistant spiral cords of nearly equal strength, the points of intersection produced into transversely oval gemmules; the interstices between the spirals of about equal width as the cords, but that below the first spiral is slightly deeper and broader than the others; on the body-whorl there are about 15 spirals, of which the lowest 6 are smooth. *Colour* white. *Spire* elevated conic, outlines somewhat convex, but little higher than the aperture. *Protoconch* a little oblique to the axis, of $1\frac{1}{2}$ smooth whorls, the nucleus globose. *Whorls* 6, the last high and somewhat ventricose, convex, attenuated toward the base. *Suture* not deep, undulating, bimarginate. *Aperture* slightly oblique, high and narrow, angled above, with a rudimentary broad canal below; its base truncated. *Outer lip* convex, thin, crenated on the outside by the spiral sculpture, with a shallow sinus below the suture. *Columella* subvertical, almost straight, with 2 rounded short plaits above, absent in young examples. *Inner lip* thin and narrow, spreading over the straight parietal wall. *Operculum* unknown.

Diameter, 3·1 mm.; height, 7·2 mm.

Animal unknown.

Type in my collection.

Hab.—Near the Snares, in 50 fathoms, type (Captain Bollons); twenty-four miles south-east of Long Point, in 120 fathoms; off south-east of Cape Saunders, in 100 fathoms (Edgar R. Waite).

Remark.—In form and sculpture somewhat resembling *Daphnella vestalis*, Hedley.

2. **Mitromorpha striata**, Hutton, 1873. Plate 46, fig. 27.

Bela striata, Hutt., C. Tert. M., 1873, 5. *Daphnella striata*, Hutt., P.L.S. N.S.W. (2), i, 1886, 214; Plioc. M., 52, pl. 7, f. 33. *Mitromorpha striata*, Hutt.: Suter, T.N.Z.I., xxxix, 265.

Shell mitriform, rather thin, turriculate, finely spirally lirate. *Sculpture* consisting of very fine, somewhat unequal and crowded spiral liræ, absent on the narrow shoulder, but covering the whole of the base; they are lightly decussated by the fine growth-lines. *Colour* white. *Spire* elevated conic, turriculate, of the same height as the aperture. *Protoconch* of $1\frac{1}{2}$ carinated and finely spirally striate whorls, the nucleus small, rounded, depressed. *Whorls* about 6, narrowly shouldered, flatly convex below the angle, body-whorl contracted towards the beak. *Suture* uneven, but little impressed. *Aperture* slightly oblique, narrowly ovate, broadly angled above, with a short broad and recurved canal below, its base not emarginate. *Outer lip* lightly convex, subangled above, very little contracted below, somewhat thickened and minutely crenate within, with a broad and very shallow sinus close to the suture. *Columella* vertical, slightly arcuate. *Inner lip* narrow, distinctly bordered, the edge uniting above with

the outer lip, a few very indistinct tubercles on the columella. *Operculum* (?).

Diameter, 7 mm. ; height, 16 mm.

Animal unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—Near Cuvier Island, in 37 fathoms (Captain Bollons).

Remark.—The generic position of this species is somewhat doubtful, as we do not know whether an operculum is present or not. Although the columellar plaits are very indistinct in the Recent specimen and absent in fossil forms, the globose nucleus, the crenate outer lip, and the form of the shell induce me to class it for the present under *Mitromorpha*.

Fossil in the Miocene and Pliocene.

3. Mitromorpha substriata, Suter, 1899. Plate 21, fig. 15.

Daphnella substriata, Sut., T.N.Z.I., xxxi, 1898 (1899), 76, pl. 3, f. 6 ; Index, 71. *Mitromorpha substriata*, Sut. : Hedley, Rec. A.M., v, 1904, 97 ; Murdoch, T.N.Z.I., xxxvii, 1905, 230.

Shell small, mitriform, thin and fragile, white with a violet apex, finely spirally striated. *Sculpture* consisting of delicate equal and numerous fine spiral striæ, extending over the whole shell except the protoconch, the spiral below the suture a little stronger than the others ; frequent inequidistant faint growth-periods form the only axial sculpture. *Colour* whitish, the protoconch light violet. *Spire* elevated, conic, about $1\frac{1}{2}$ times the height of the aperture. *Protoconch* of $1\frac{3}{4}$ whorls, smooth, globose, the nucleus flatly convex, slightly lateral. *Whorls* 6, regularly increasing, moderately convex ; base slightly contracted. *Suture* not deep, margined by the spirals. *Aperture* very little oblique, subrhomboidal, angled above, produced below into a very short broad recurved canal, its base lightly emarginate. *Outer lip* regularly convex, somewhat thickened inside, minutely crenate. *Columella* vertical, slightly arcuate, excavated on meeting the parietal wall, twisted below with a slightly raised edge. *Inner lip* thin and narrow, smooth. *Operculum* (?).

Diameter, 2·25 mm. ; height, 5·5 mm.

Animal unknown.

Type in my collection.

Hab. — Foveaux Strait, in 15 fathoms, type (A. Hamilton) ; Whangaroa Harbour (C. Traill).

Genus 2. Bathytoma, Harris and Burrows, 1891.

Bathytoma, H. & B., Eoc. & Oligoc. Paris Basin, 1891, 113. Type : *Murex cataphractus*, Brocchi. *Dolichotoma*, Bell., 1875 ; not of Hope, 1839.

Shell oval, ventricose ; spire conoidal, turriculate ; protoconch smooth, regularly conic, the nucleus slightly deviated ; whorls with a crenate keel below the middle, excavated on the shoulder, the last whorl large, oval, attenuated at the base ; aperture narrow, sub-

pyriform, angled above, with a long curved canal; outer lip fairly thick, convex, sometimes plicate within, with a deep sinus on the carina; columella sinuous, with an oblique thickening opposite the fasciole of the beak; inner lip thin, drawn out to a fine point on the edge of the canal, broadly spreading over the body above.

Distribution.—California, Philippines, East Africa, Australasia.

Fossil in the Tertiary from the Eocene.

The type is from the Pliocene of Italy.

KEY TO SPECIES.

A. Suture simple, not distinctly margined.
  a. Spire-whorls with 3 prominent keels .. .. .. *albula.*
  b. Spire-whorls with 1 slightly nodulous spiral rib at the shoulder, the latter axially costate; 2 narrow spiral grooves near the suture below .. .. *Cheesemani.*
  c. Spire-whorls with a rounded keel at the middle, and numerous spiral threads below; suture canaliculate .. *engonia.*
B. Suture distinctly margined.
  a. Shell very small; spire-whorls with 3 spiral cords, the uppermost feeble; distinct retrocurrent and flexuous axial threads .. .. *gratiosa.*
  b. Shell moderately large; spire-whorls with a row of about 16 prominent tubercles .. .. *nodilirata.*

1. **Bathytoma albula,** Hutton, 1873. Plate 21, fig. 16.

Pleurotoma albula, Hutt., C.M.M., 12. *Drillia albula,* Hutt., J. de Conch., xxvi, 17. *Pleurotoma albula,* Hutt., M.N.Z.M., 43; P.L.S. N.S.W., x, 116; Plioc. M., 49, pl. 6, f. 22. *Surcula albula,* Hutt.: Suter, T.N.Z.I., xxxi, 68; Index, 71. *Bathytoma albula,* Hutt.: Suter, J. Mal., xii, 73. *Pleurotoma antipodum,* E. A. Smith, A.M.N.H. (4), xix, 1877, 491; M.N.Z.M., 43.

Shell small, fusiform, spirally ribbed, with a short canal and twisted columella. *Sculpture:* Spire-whorls with a prominent smooth spiral rib at the lower third of the whorls, a smaller rib below the suture and one above it, the latter sometimes split into 2 fine threads, the interspace between the first and second rib, which contains the crescent-shaped growth-lines of the sinus, with a fine spiral thread; body-whorl with about 15 spiral liræ below the carina, usually stronger and finer threads alternating; they are fine and close on the fasciole of the beak; the somewhat irregular fine growth-lines are distinct in the shallow grooves. *Colour* pinkish-brown, dead shells white. *Spire* acuminate, high, conic, a little higher than the aperture. *Protoconch* conical, of 2 smooth convex whorls, the nucleus slightly lateral. *Whorls* 7 to 8, first slowly increasing, carinate, concave above and below the keel; base somewhat contracted. *Suture* lightly impressed. *Aperture* pyriform, angled above, narrowed below to a rather short recurved canal, its base not notched. *Outer lip* angled above, convex below the carina, contracted toward the canal, a fairly deep rounded sinus just above the keel in the excavation between the first and second ribs, which, on the body-whorl, is sometimes adorned with 2 or 3 fine spiral threads. *Columella* slightly excavated, twisted below, and with a low fold opposite the fasciole. *Inner lip*

narrow below, drawn out to a fine point toward the canal, spreading more broadly over the arcuate parietal wall. *Operculum* unknown.

Diameter, 3·75 mm. ; height, 9 mm. Angle of spire, 30°.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Throughout New Zealand, in about 5 to 25 fathoms, but far from common. The type is from 24 fathoms, Stewart Island. Rangitoto Channel, dredged (T. F. Cheeseman) ; Cheltenham Beach (H. S.) ; Snares, in 50 fathoms (Captain Bollons).

Fossil in the Pliocene and Miocene.

2. **Bathytoma Cheesemani,** Hutton, 1878. Plate 49, fig. 5.

Drillia Cheesemani, Hutt., J. de Conch., xxvi, 1878, 16 ; M.N.Z.M., 44 ; T.N.Z.I., x, 294. *Pleurotoma Cheesemani,* Hutt., Plioc. M., 49, pl. 6, f. 24. *Surcula Cheesemani,* Hutt. : Suter, T.N.Z.I., xxxi, 69 ; Index, 71. *Pleurotoma zealandica,* E. A. Smith, A.M.N.H. (4), xix, 1877, 492 ; M.N.Z.M., 43. *Bathytoma zealandica,* E. A. Smith : Suter, J. Mal., xii, 73.

Shell oval-fusiform, gradated, fairly strong, spirally lirate, light brown, somewhat shining. *Sculpture :* The protoconch is smooth, the succeeding whorls are very narrowly shouldered, the slope strongly axially striated, keeled below by a narrow spiral rib, which is slightly nodulous ; this is followed, separated by a narrow groove, by a broad flat spiral band, ornamented by the crescent-shaped growth-lines of the slit, and below this are 2 narrower flat spiral bands, separated by linear grooves ; on the body-whorl below the periphery are about 11 unequal and inequidistant slightly raised and flat spiral liræ ; the fasciole margined by a sharply raised ridge and with a few oblique riblets. Growth-lines distinct, fine and crowded, flexuous, passing over the cinguli, but more distinct in the very shallow grooves. *Colour :* The apex dark brown, the spire-whorls yellowish-brown, the base purplish-brown, the keel on the fasciole usually darker ; interior of aperture and inner lip brown. *Spire* conoidal, gradate, with a sharp apex, very little higher than the aperture with canal. *Protoconch* minute, conic, smooth, the nucleus somewhat tilted. *Whorls* 9, lightly convex below the shoulder ; body-whorl large, somewhat inflated, contracted towards the base. *Suture* well marked. *Aperture* large, oval, oblique, angled above, with a short broad and recurved canal, its base notched. *Outer lip* convex, thin and sharp, with a broad rounded and moderately deep sinus, situate at the broad spiral band above the periphery. *Columella* lightly excavated, vertical, with a distinct broadly rounded fold below, twisted, bent to the left, and drawn out to a fine point. *Inner lip,* thin, spreading a short distance beyond the pillar, and broadly on the arcuate parietal wall. *Operculum* small, the nucleus subapical.

Diameter, 9 mm. ; height, 19·2 mm. (type). Diameter, 12 mm ; height, 26 mm. (large specimen).

Type in the Otago Museum, Dunedin.

Hab.—Sandy bays between the North Head and Takapuna, type (T. F. Cheeseman); Te Onepoto, near Lyttelton (H. S.); Chatham Islands; Kermadec Islands (Captain Bollons); Bay of Islands.

Remark.—As Mr. E. A. Smith's species was never figured, I give preference to Hutton's name.

Fossil in the Pliocene.

3. **Bathytoma engonia,** Watson, 1881. Plate 21, fig. 17.

Pleurotoma (*Genota*) *engonia,* Wats., J.L.S., xv, 1881, 405; Chall. Rep., xv, 300, pl. 20, f. 7. *P. engonia,* Wats.: Hutton, P.L.S. N.S.W., x, 115. *Genotia engonia,* Wats., Index, 70.

Shell fusiform, biconical, with an expressed rounded keel angulating the whorls, and a broad prominent lopsided beak. *Sculpture:* There are no axial ribs; the lines of growth are strong, hair-like, unequal, and close-set, on the keel they are exceptionally strong, regular, and a little remote, as they are also at the top of the whorls in the suture. The whorls are angulated about the middle, projecting in a rather narrow, prominent, rounded keel, almost crenulated by growth-lines. The whole surface covered by small, broadish, rounded, close-set spiral threads, somewhat granulated at the base. On the left side of the point of the beak and also on the earlier regular whorls they tend to become obsolete. *Colour* porcellanous-white. *Epidermis* thin, yellowish, membranaceous. *Spire* high, conical, about the same height as the aperture. *Protoconch* blunt, rounded, of 2 smooth globular whorls. *Whorls* 8, broad, short, regularly increasing, the last rather large, with a sloping slightly concave shoulder, straight below the keel; at the top of each whorl there is a slight collar, which gives the effect of a slight canaliculation to the suture; base somewhat swollen, prolonged into a short broad unequal-sided beak. *Suture* strong and slightly canaliculated. *Aperture* large, almost rhomboidally pear-shaped, sharply angled above, and with a broad open canal below. *Outer lip* regularly curved, thin and sharp, with an open V-shaped sinus at the shoulder, rounded at the angle; below this it sweeps downwards and a little forwards, forming a very low-shouldered wing; towards the lower part of the aperture it curves very regularly backwards to the point of the pillar. *Columella* narrow and short, very obliquely truncate below, with a fine, but strong, sharpish twisted edge. *Inner lip* polished and porcellanous, rather broadly excavated in the substance of the shell; scarcely convex on the parietal wall, very slightly concave at the junction with the columella. (Watson.)

Diameter, 13 mm.; height, 31·9 mm.

Animal unknown.

Type in the British Museum.

Hab.—Off East Cape, in 700 fathoms; "Challenger" Station 169. Also off Inosima, Japan, in 345 fathoms.

Remark.—Watson remarks that this species has a most striking resemblance with the fossil *Pleurotoma cataphracta,* Brocchi. This, however, is the type of the genus *Bathytoma.*

4. **Bathytoma gratiosa,** Suter, 1908. Plate 21, fig. 18.

Bathytoma gratiosa, Suter, P. Mal. S., viii, 1908, 186, pl. 7, f. 19.

Shell very small, fusiform, white, thin, turriculate, spirally distantly ribbed, and with numerous axial threads. *Sculpture:* The spire-whorls below the smooth protoconch have a fine thread margining the suture below, a second very prominent spiral cord on the angle of the shoulder, and a third equally strong cord at the middle between the angle and the suture below; the interstices concave and broader than the cords; body-whorl 6 spirals from the angle down toward the base, the upper three of which are strong, the others closer together and not so high; base with a few indistinct spirals. Axial sculpture consisting of subequidistant fine threads, slightly retrocurrent on the shoulder, flexuous further down; on the body-whorl they are becoming more irregular, fine growth-lines appearing in the interstices. *Colour* whitish. *Spire* conic, turriculate, about the same height as the aperture. *Protoconch* globular, smooth, of $1\frac{1}{4}$ whorls. *Whorls* 4, with a very distinct and but slightly sloping shoulder; base somewhat contracted. *Suture* superficial, margined. *Aperture* subpyriform, angled above, with a short and broad canal below, slightly emarginate at the base. *Outer lip* angled above, then convex, contracted below, thin and sharp, crenulated on the outside by the spirals; sinus rounded, not deep, situate just above the carina. *Columella* straight, smooth, concave on meeting the parietal wall, bent to the left towards the canal below. *Inner lip* thin, narrow, extending over the faintly convex parietal wall, tapering to a fine point below. *Operculum* unknown.

Diameter, 2 mm.; height, 3·7 mm.

Animal unknown.

Type in my collection.

Hab. — Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons).

5. **Bathytoma nodilirata,** Murdoch and Suter, 1906. Plate 21, fig. 19.

Pleurotoma (*Hemipleurotoma*) *nodilirata,* M. & S., T.N.Z.I., xxxviii, 1905 (1906), 284, pl. 22, f. 10, 11. *P. tuberculata,* T. W. Kirk, T.N.Z.I., xiv, 1881 (1882), 409; Hutton, Plioc. M., 50, pl. 6, f. 29; not of Gray. *Bathytoma nodilirata,* M. & S.: Suter, T.N.Z.I., xl, 1907 (1908), 351.

Shell fusiform, biconical, with nodulous keeled whorls, pyriform aperture, and short open canal. *Sculpture:* The last whorl with about 16 tubercles on the keel, and a similar number of spiral cords below, the upper six of which are widely spaced and narrower than the interspaces; those upon the base and canal are smaller and crowded. Above the aperture is a single cord, which persists on the whorl above, but disappears in the suture of the next whorl. Monilo-spiral threadlets adorn the sinus-area, also the tubercles. All the upper whorls, except the protoconch, have tubercles on the keel, and there is a row of small nodules below the suture. The axial sculpture consists of

fine rather irregular incremental lines, which, however, become more prominent on the lower whorls, connecting the small tubercles below the suture with the larger ones on the keel. *Colour* light cream. *Spire* conical, about as high as the aperture. *Protoconch* consisting of $1\frac{1}{2}$ to 2 whorls, the nucleus obtuse, smooth, polished, the succeeding volution with minute spiral striæ. *Whorls* 7, slowly and regularly increasing, with a strong carina below the middle, excavated above and straight below the keel; base convex, ending in a slightly twisted rather short beak. *Suture* deep and margined below with a row of small elongate gemmules. *Aperture* pyriform, rather narrow, angular above, terminating in a short open and truncated canal, which has a slight turn to the right. *Outer lip* sharp, strongly angled, and with a well-pronounced rounded sinus at the keel, contracted towards the base. *Columella* nearly straight, with an oblique thickening, slightly sinuated and pointed below. *Inner lip* forming a very thin obliquely finely striated layer on the columella and body.

Diameter, 8·5 mm.; height, 19·6 mm. Angle of spire, 42°.

Animal unknown.

Type of *P. tuberculata* in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms; near Cuvier Island, in 37 fathoms (Captain Bollons).

Remarks.—Of this species a smaller form occurs, but similarly sculptured, and it seems scarcely worth a varietal name. It is also found in the Wanganui blue clay of Pliocene age. The larger type specimens in the Dominion Museum are from the Petane Pliocene; in these, as also in the smaller form, the tubercles are less strong and more numerous than in Recent examples. This species is a typical *Bathytoma*.

Fossil in the Pliocene.

Subfam. 4. MANGILIINÆ.

No operculum. Labial sinus at the suture. Protoconch papillate.

Key to Genera.

A. Lip thick, varicose, smooth inside; sinus moderately deep; protoconch papillate .. .. MANGILIA.

B. Lip thin, dilated towards the base; sinus deep; canal short, not notched at the base; whorls finely cancellated; protoconch polygyrate, reticulated .. .. DAPHNELLA.

Genus 1. MANGILIA (emend.), Risso, 1826.

Mangelia, Risso, Hist. Nat. Europe Mérid., iv, 1826, 219. Type: *M. costulata*, Risso. *Clathromangelia*, Monts., 1884. *Cytharella*, Monts., 1875. *Pseudoraphitoma*, Boettg., 1895. *Paraclathurella*, Boettg., 1895 (*fide* Cossmann).

Animal with slender tentacles, and bearing the eyes at various heights on external bulgings. Foot ample, truncate in front. Siphon produced beyond the canal; 2 branchial plumes. Teeth of radula having the formula 1+0+1; the teeth triangular.

Shell small, fusiform ; spire rather short, sometimes scalar ; protoconch with convex whorls and papillate nucleus ; whorls with axial riblets, sometimes crossed by spiral striæ, the last whorl equal or superior to half the height of the shell ; aperture narrow, sides subparallel ; canal short, not notched at its base ; outer lip thickened by the last riblet, smooth inside, with a moderately deep sinus at the suture ; columella straight, smooth.

Distribution.—A great number of species, inhabiting all portions of the globe.

Fossil in the Tertiary from the Eocene.

KEY TO SPECIES.

A. Spire of the same height as the aperture, or but little higher.
  a. Axial riblets on a whorl less than 18.
    b. Axial riblets 9–10, continuous over the whorls ; minute close spiral threads ; spire a little higher than the aperture .. .. *Goodingi.*
    bb. Axial riblets 10–16 ; many more or less distinct spiral striæ ; spire a little higher than the aperture ; base usually with a brown band .. .. .. *Sinclairi.*
    bbb. Axial riblets about 15, faint, flattish ; microscopic spirals, 3 of which are more distinct on the penultimate whorl ; spire of the same height as the aperture *murrhea.*
  aa. Axial riblets about 18 on a whorl.
    b. Protoconch smooth.
      c. Spire-whorls with 6 spiral cords, points of intersection nodulous .. .. *cophinodes.*
      cc. Spiral cords 2 on the penultimate and 4 on the body-whorl .. .. *quadricincta.*
    bb. Protoconch microscopically spirally striate ; axial riblets flexuous ; spiral sculpture microscopic .. *flexicostata.*
    bbb. Protoconch with smooth nucleus, the second whorl reticulate ; strong equidistant spiral cords, which do not pass over the riblets ; suture submargined *subaustralis.*
B. Spire 1½ times the height of the aperture.
  a. Protoconch smooth.
    b. Axial riblets 9, penultimate whorl with 3 prominent spiral cords .. .. *infanda.*
    bb. Axial riblets about 13, numerous spiral threads .. *dictyota.*
    bbb. Axial riblets 15–20.
      c. Axial riblets 16, nearly continuous over the whorls ; penultimate whorl with 8 spiral threads, 4 of which are on the shoulder ; crossing-points gemmate ; suture lightly margined.. .. *munda.*
      cc. Axial riblets 15–20 : penultimate whorl with 8 spiral threads, 3 of them on the shoulder ; suture simple .. .. *protensa.*
  aa. Protoconch with a carinate nucleus ; axial riblets 10, strong, nodulous ; 3 spiral cords .. .. .. *devia.*
  aaa. Protoconch angled, with 4 spirals ; axial riblets 15–16 ; fine spiral threads .. .. *epentroma.*

1. **Mangilia cophinodes,** Suter, 1908. Plate 21, fig. 20.

Mangilia cophinodes, Suter, P. Mal. S., viii, 1908, 188, pl. 7, f. 22.

Shell small, elongate-oval, white, with traces of a brown spiral band, axially costate and spirally lirate. *Sculpture* consisting of narrow rounded axial costæ, about 18 on the last whorl, getting obsolete on the base; they are slightly oblique and curved, the interstices of the same width as the riblets; crossed by spiral cords with linear interspaces, 6 on the spire-whorls, about 18 on the body-whorl, the spirals on the beak much finer; points of intersection very slightly nodulous. *Colour* whitish, with a trace of a brown spiral band below the periphery. *Spire* conical, slightly higher than the aperture; outlines almost straight. *Protoconch* conic, of 2 smooth whorls, the nucleus broadly rounded. *Whorls* 6, regularly increasing, moderately convex, base contracted. *Suture* well impressed. *Aperture* subrhomboidal, roundly angled above, with a short oblique broad canal below, its base very slightly notched. *Outer lip* lightly convex, somewhat strengthened on the outside by the last axial rib, smooth inside, with a broad and shallow sinus below the suture. *Columella* vertical, excavated towards the parietal wall, slightly convex below, bent towards the margin of the canal. *Inner lip* thin and narrow, smooth.

Diameter, 3·1 mm.; height, 7 mm.

Animal unknown.

Type in my collection.

Hab.—Near the Snares, in 50 fathoms (Captain Bollons).

Remark.—A near ally of this species is the Pliocene *M. Hamiltoni*, Hutt., which has more prominent smooth axial ribs; they number only 12 to 15 on a whorl, and the spirals are mostly inconspicuous, and not passing over the ribs, which extend over the whole of the base.

2. **Mangilia devia,** Suter, 1908. Plate 21, fig. 21.

Mangilia devia, Suter, P. Mal. S., viii, 1908, 187, pl. 7, f. 20.

Shell small, fusiform, turriculate, with distant nodulous axial ribs, continuous over the whorls, spirally distantly lirate, whitish, with indications of 2 brown spiral bands. *Sculpture:* The protoconch has a sharp carina on the nucleus, 2 on the succeeding half-volution, and this is continued on the next three spire-whorls, the upper spiral on the angle of the shoulder, the second midway between angle and suture; on the following whorl a third spiral appears just above the angle of the shoulder, and on the penultimate whorl an additional fine spiral above it, thus giving these lower whorls a more convex outline, the shoulder becoming inconspicuous on the body-whorl, which has 5 additional spirals in front of the aperture. The axial sculpture consists of rather distant, slightly oblique, broad and distant ribs, about 10 on the last whorl, strongly nodulous at the

points of intersection, continuous over the whorls and on the base to the siphonal fasciole; the interstices slightly broader than the ribs. *Colour* yellowish-white, with indications of 2 brown spiral bands above and below the periphery. *Spire* produced, conic, turreted, nearly 1½ times the height of the aperture with canal. *Protoconch* with the nucleus distinctly oblique, flat above the carina. *Whorls* 6½, the upper ones distinctly shouldered, the lower ones convex, base contracted. *Suture* inconspicuous. *Aperture* oblique, pyriform, broadly angled above, produced below into a short oblique truncated canal. *Outer lip* convex, strengthened on the outside by the last axial rib, smooth inside, contracted below, the sinus inconspicuous, shallow. *Columella* vertical, smooth, obliquely truncated below, concave at the junction with the parietal wall. *Inner lip* thin and narrow, drawn out to a fine point on reaching the left margin of the canal.

Diameter, 3 mm.; height, 7·2 mm.

Animal unknown.

Type in my collection.

Hab.—Near the Snares, in 50 fathoms (Captain Bollons).

Remarks.—In sculpture this species somewhat resembles *M. dictyota*, Hutton, but this has not the tilted and carinated protoconch and coarse spiral sculpture of the base. *M. epentroma*, Murdoch, has a similar protoconch.

3. **Mangilia dictyota**, Hutton, 1885. Plate 21, fig. 22.

Clathurella dictyota, Hutt., T.N.Z.I., xvii, 1884 (1885), 316, pl. 18, f. 8. *Mangilia dictyota*, Suter, T.N.Z.I., xxxi, 72. *Clathurella* (?) *dictyota*, Hutt., Plioc. M., 53, pl. 7, f. 37.

Shell small, elongate-fusiform, turriculate, axially costate and spirally lirate, whitish or light brown. *Sculpture* consisting of narrow, rounded, straight axial ribs, about 13 on a whorl, extending from suture to suture, continuous over the whorls, extending over the base of the body-whorl, the interstices wider than the ribs, crossed by more or less conspicuous spiral threads, 1 on the carina of the shoulder and another half-way down more prominent than the others, a few hair-like threads upon the shoulder, and 2 or 3 below it; body-whorl generally with 3 or 4 more prominent spiral liræ, the interstices with 1 to 3 fine spiral threads. Sometimes the surface is distinctly cancellated. *Colour* whitish or light brown; sometimes a brown band appears on the base of the penultimate whorl, and is continued on the body-whorl; inner lip mostly dark violet or brown, especially the lower part of it. *Spire* acuminate, turriculate, about 1½ times the height of the aperture. *Protoconch* with a small, papillate, smooth, slightly tilted nucleus, followed by a convex and spirally lirate second volution; sometimes the nucleus is also spirally striated. *Whorls* 6, more or less distinctly shouldered, flatly convex and contracted towards the suture below; base contracted. *Suture* undulating, not

deep. *Aperture* subpyriform, angled above, with a short broad and somewhat recurved canal below. *Outer lip* thickened by the last rib, convex, lightly contracted below, with a shallow rounded sinus. *Columella* vertical, lightly arcuate. *Inner lip* narrow, smooth, extending over the straight parietal wall.

Diameter, 3 mm.; height, 6 mm. Examples from Foveaux Strait, 2 mm. by 5 mm.

Animal unknown.

Type, from the Pliocene, in the Canterbury Museum, Christchurch.

Hab.—Off Great Barrier Island, in 110 fathoms; Hauraki Gulf (H. S.); Lyall Bay; Foveaux Strait, in 15 fathoms (A. Hamilton); Chatham Islands; near the Snares, in 50 fathoms (Captain Bollons); near Cuvier Island, in 38 fathoms (Captain Bollons).

Fossil in the Pliocene.

4. **Mangilia ependroma**, Murdoch, 1905. Plate 21, figs. 23, 23*a*.

Clathurella ependroma, Murd., T.N.Z.I., xxxvii, 1904 (1905), 219, pl. 7, f. 3, 4; Suter, J. Mal., xii, 73.

Shell small, narrowly fusiform, thin, lightly turriculated, with prominent axial riblets, spirally striate. *Sculpture* consisting of narrow equidistant axial riblets, 15–16 on the last whorl, equal to or rather wider than the interspaces, and usually less developed on the anterior end; they are continuous in some, irregular in other examples; the spirals consist of undulating delicate riblets and threads. On the spire-whorls there are 2, and on the last 7 or 8 slightly stronger; of these, the four posterior are more widely spaced, two are above the outer lip, and one in line with it; frequently forming beads on crossing the axials. Within these spaces there are, on that adjoining the suture, 4 or 5 threadlets, sometimes irregular in size; on the succeeding three spaces usually 3 threadlets in each, the median one frequently strongest. Anterior to this the interspaces with 1 to 3 threads. Fasciole on the beak sometimes with irregular riblets. *Colour* light rufous or dull chestnut. *Spire* elevated conic, lightly turriculate, about $1\frac{1}{2}$ times the height of the aperture. *Protoconch* of $1\frac{1}{2}$ whorls, strongly angled, and with 4 narrow revolving riblets, the posterior minute and near the suture; the apical half-turn obliquely curved down and somewhat imbedded in the succeeding whorl. *Whorls* $5\frac{1}{2}$, rounded, or obscurely angled above the periphery; base somewhat contracted. *Suture* deep. *Aperture* subvertical, oval, angled above, with a short and broad canal below. *Outer lip* simple, convex, smooth inside, with a shallow sinus close to the suture. *Columella* vertical, lightly curved, smooth. *Inner lip* narrow and thin.

Diameter, 2·1 mm.; height, 5·7 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Whangaroa Harbour, type (C. Traill); Foveaux Strait, in 15 fathoms (A. Hamilton); near the Snares, in 50 fathoms (Captain Bollons).

Subsp. whangaroaensis, Murdoch, 1905.

Clathurella epentroma whangaroaensis, Murd., T.N.Z.I., xxxvii, 1904 (1905), 219, pl. 7, f. 5. *Mangilia* (*Clathurella*) *epentroma whangaroaensis*, Murd.: Suter, J. Mal., xii, 73.

Differs from the species in the whorls being strongly angled, spire somewhat turreted, and the principal spiral riblets much more pronounced, but similarly placed. Colour, number of whorls, and protoconch the same as in the species. Axial ribs 14 on the last whorl, equal to or narrower than the interspaces. Spirals—on the spire-whorls 2, and on the last 4 or 5, prominent and forming beads on crossing the axials. In addition there are on the anterior end a few more crowded and rather smaller; the interspaces with spiral striæ, 4 or more usually minute, sometimes almost microscopic. Spire $1\frac{1}{2}$ times the height of the aperture. Outer lip with usually 5 well-marked sinuations corresponding to the principal spirals; posterior sinus shallow.

Diameter, 2·5 mm.; height, 6·8 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Whangaroa Harbour, type (C. Traill).

Remark.—This form seems to somewhat approach *Mangilia connectans*, Sow., from South Australia.

5. Mangilia flexicostata, Suter, 1899. Plate 21, fig. 24.

Mangilia flexicostata, Suter, T.N.Z.I., xxxi, 1898 (1899), 73, pl. 3, f. 3.

Shell minute, elongated oval, gradate, flexuously costate, semi-transparent, thin and fragile. *Sculpture* consisting of axial narrow and flexuous riblets, about 18 on the last whorl, antecurrent upon the shoulder, obsolete towards the base, the interstices of about the same width as the riblets, and microscopically spirally striate. *Colour* whitish, vitreous. *Spire* conic, gradate, of about the same height as the aperture. *Protoconch* papillate, of $1\frac{1}{2}$ whorls, microscopically spirally striate, but very often worn smooth. *Whorls* 5, rather rapidly increasing, with a narrow, but little-sloping shoulder, almost flat below it; base contracted. *Suture* deep. *Aperture* narrowly oval, angled above, with a short oblique broad and slightly recurved canal, truncated at its base. *Outer lip* somewhat thickened, angled above, moderately convex or almost straight at the middle, somewhat contracted below, with a broad shallow sinus just below the suture. *Columella* arcuate, turned to the left below. *Inner lip* thin and narrow.

Diameter, 1·25 mm.; height, 2·25 mm.

Animal unknown.

Type in my collection.

Hab.—Foveaux Strait, in 15 fathoms, type (A. Hamilton); Whangaroa Harbour (C. Traill); near Little Barrier Island, in 20 fathoms (R. H. Shakespear); near the Snares, in 50 fathoms (Captain Bollons).

6. **Mangilia Goodingi**, E. A. Smith, 1884. Plate 22, fig. 1.

Pleurotoma (*Mangilia*) *Goodingi*, E. A. Smith, A.M.N.H. (5), xiv, 1884, 320. *Mangilia Goodingi*, Hutton, P.L.S. N.S.W., x, 117; Suter, T.N.Z.I., xxxi, 71.

Shell acuminately ovate, turriculate, white with series of red dots, axially costate and spirally lirate. *Sculpture* consisting of 9 to 10 prominent plicate axial ribs, continuous up the spire and extending to the base of the last whorl, the interstices somewhat broader than the ribs; the whole shell is minutely and closely spirally striate. *Colour* white, ornamented with series of red dots on the ribs, one above the periphery, another near the base of the whorls, and a third towards the base of the body-whorl. *Spire* acuminate, conic, turriculate, a little higher than the aperture. *Protoconch:* The nucleus small, globular, the second whorl broad and low, strongly convex, much contracted toward the suture below. *Whorls* 7, slightly shouldered, almost flat; base moderately contracted. *Suture* distinct. *Aperture* narrow, angled above, produced below into a narrow and short canal, its base straight. *Outer lip* thickened by the last rib, lightly convex, with a shallow sinus above. *Columella* somewhat arcuate. The *inner lip* narrow.

Diameter, 2·7 mm.; height, 7·5 mm. (type).

Animal unknown.

Type in the British Museum.

Hab.—New Zealand.

Remarks.—This species and *M. Sinclairi* are very closely allied, but the protoconchs are quite distinct. In the latter species the brown or reddish spiral bands are continuous, not dissolved into spots, and the ribs do not extend over the beak.

7. **Mangilia infanda**, Webster, 1906. Plate 22, fig. 2.

Mangilia infanda, Webster, T.N.Z.I., xxxviii, 305, pl. 38, f. 2.

Shell small, fusiform, turreted, clathrate, thin and fragile. *Sculpture:* Axially vertically ribbed, the ribs strong right up to the suture and persisting faintly down the base; body-whorl with about 9 ribs. Strong spirals cross the ribs, 2 on the second whorl, 3 above the aperture, a fourth and faint fifth further down on the body-whorl, with finer spirals in the interspaces; base spirally striated. *Colour* white, chalky (dead shell). *Spire* conic, turreted, about $1\frac{1}{2}$ times the height of the aperture. *Protoconch* of about $1\frac{1}{2}$ whorls, papillate, smooth. *Whorls* 5, lightly shouldered, somewhat convex below, the base con-

tracted. *Suture* of the early whorls sharp, of those succeeding concavely rounded. *Aperture* ovate, with a short open canal. *Outer lip* broken away in the only type specimen. *Columella* straight, pointed below. *Inner lip* narrow, spreading over the somewhat convex parietal wall.

Diameter, 3 mm. ; height, 6 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms.

8. Mangilia munda, Suter, 1909. Plate 22, fig. 3.

Mangilia munda, Suter, Rec. Canterbury Museum, i, No. 2, 1909, 129, pl. 12, f. 6.

Shell small, elongate-fusiform, thin and fragile, white, turreted, axially costate and spirally striated. *Sculpture* consisting of narrowly rounded, slightly oblique axial riblets, about 16 on the last whorl, nearly continuous over the whorls, obsolete on the base, the interstices slightly broader than the riblets ; they are crossed by spiral threads, 4 fine and close together on the shoulder, 1 on the carina of the whorl, and 3 below it, the uppermost of these at some distance from the keel ; the crossing-points produced into small oval gemmules ; the base is spirally striate, all the striæ in front of the aperture being smooth. *Colour* white. *Spire* elevated conic, turriculate, nearly $1\frac{1}{2}$ times the height of the aperture. *Protoconch* globular, of $1\frac{1}{2}$ smooth whorls, the nucleus broadly rounded. *Whorls* 6, regularly increasing, with a high sloping shoulder, the keel on the spire-whorls near the middle, flat above and below the keel ; base contracted. *Suture* somewhat impressed, lightly margined below. *Aperture* pyriform, broadly angled above, with a short, broad, oblique, and truncated canal below. *Outer lip* convex, thickened by an axial rib, slightly angled above, and somewhat contracted below, with a shallow broad sinus at the suture. *Columella* slightly oblique, lightly excavated towards the straight parietal wall, curved below, and extending to the left margin of the canal. *Inner lip* thin, narrow, smooth.

Diameter, 3·2 mm. ; height, 7·5 mm.

Animal unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—Twenty miles north-east of Flat Point, in 105 fathoms (Edgar R. Waite).

Remark.—The species is closely related to *M. dictyota*, Hutt., which, however, has less axial riblets ; the angle of the shoulder is above the middle of the spire-whorls ; and the protoconch is much smaller, with a minutely pointed nucleus.

9. Mangilia murrhea, Webster, 1906. Plate 22, fig. 4.

Mangilia murrhea, Webster, T.N.Z.I., xxxviii, 1905 (1906), 305, pl. 38, f. 1.

Shell small, fusiform, semitransparent, thin and fragile, turriculate, faintly clathrate. *Sculpture* consisting of distant faint and flattish

axial riblets, faint on the shoulder and obsolete towards the base, about 15 on the last whorl, the interstices slightly broader than the riblets, adorned with numerous hair-like growth-lines; crossed by faint spirals, that upon the keel stronger than the others, spire-whorls with 2 spirals below the first, body-whorl with 4 to 5 spirals, three of them above the aperture, the interspaces with very fine microscopic spiral lines. *Colour* white, somewhat vitreous. *Spire* conic, gradate, with a blunt apex, of about the same height as the aperture; base finely spirally striate. *Protoconch* rather large, papillate, smooth, of $1\frac{1}{4}$ whorls. *Whorls* $4\frac{1}{2}$, distinctly and broadly shouldered, the angle near the middle of the whorls, straight and somewhat receding below the angle; base contracted. *Suture* well marked, narrowly margined below. *Aperture* narrowly pyriform, angled above, produced below into an oblique short and open canal, truncated at its base. *Outer lip* thin and sharp, angled above, slightly concave and then contracted below, with a shallow sinus below the suture. *Columella* vertical, slightly arcuate, turned to the left toward the canal, slightly excavated on meeting the straight parietal wall. *Inner lip* thin and narrow, smooth.

Diameter, 3 mm.; height, 5 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms.

10. **Mangilia protensa**, Hutton, 1885. Plate 22, fig. 5.

Daphnella protensa, Hutt., T.N.Z.I., xvii, 1884 (1885), 317. *Pleurotoma protensa*, Hutt., Plioc. M., 49, pl. 6, f. 25. *Daphnella protensa*, Hutt.: Suter, T.N.Z.I., xxxi, 76; Index, 71; Murdoch and Suter, T.N.Z.I., xxxviii, 282. *Pleurotoma* (*Drillia*) *awamoaensis*, Hutt., T.N.Z.I., xv, 131. *Drillia awamoaensis*, Hutt., Man. Conch. (1), vi, 208, pl. 12, f. 25; not of C. Tert. M., 1873. *Drillia* (?) *amœna*, E. A. Smith, A.M.N.H. (5), xiv, 1884, 318; Hutton, P.L.S. N.S.W., x, 116; Suter, T.N.Z.I., xxxi, 66; J. Mal., xii, 73. *Pleurotoma amœna*, Smith: Watson, Chall. Rep., xv, 305.

Shell fusiform, elongated, turreted, thin and fragile, lightly axially costate and spirally lirate. *Sculpture* consisting of subequidistant fine axial riblets, obsolete on the shoulder and below the periphery of the last whorl, 15 to 20 on the body-whorl, the interstices of about the same width or slightly broader than the riblets; crossed and reticulated by fine spiral threads, 3 very fine and close together on the shoulder, 5 from the angle to the suture, occasionally with a few very fine intercostital threads, 15 to 20 on the body-whorl; the crossing-points sometimes slightly nodulous; fasciole on the beak finely striated. Sometimes the spiral sculpture is predominant, the spirals becoming much stronger, crossed only by flexuous axial striæ. *Colour* light flavescent, with a white band encircling the whorls, but mostly inconspicuous. *Spire* high, conic, turreted, about $1\frac{1}{2}$ times the height of the aperture. *Protoconch* of $2\frac{1}{2}$ smooth convex whorls. *Whorls* 7 to 8, markedly

convex, the base contracted. *Suture* well marked. *Aperture* slightly oblique, oval, angled above, produced into an oblique short and open canal, truncated below. *Outer lip* thin, sometimes strengthened by the last axial riblet, with a shallow rounded infrasutural sinus. *Columella* slightly concave above, convex and curved to the left below, where it is drawn out to a fine point. *Inner lip* narrow and thin.

Diameter, 5 mm.; height, 14 mm. (type of *D. amœna*, Smith). Diameter, 2·5 mm.; height, 8·3 mm. (type of *D. protensa*, Hutt.). Diameter, 4·9 mm.; height, 12·5 mm. (specimen from Auckland).

Animal unknown.

Type of *M. protensa*, from the Pliocene, in the Canterbury Museum, Christchurch; of *M. amœna*, in the British Museum.

Hab.—Hauraki Gulf, to a depth of about 25 fathoms; off Great Barrier Island, in 110 fathoms; Stewart Island; Bay of Islands; near the Snares, in 50 fathoms (Captain Bollons); near Cuvier Island, in 38 fathoms (Captain Bollons).

Remarks.—That *M. protensa* and *amœna* are one and the same species I have not the least doubt. The figure is from the type specimen of *M. amœna* in the British Museum, which is an exceptionally large example. As Mr. E. A. Smith's species has never been figured before, I give precedence to Hutton's name. The specimen figured in Plioc. M. has exceptionally flat whorls; they are usually strongly convex, and more or less distinctly shouldered. The size of the shell is, as in *M. Sinclairi*, very variable, and so is also the development of the sculpture.

Fossil in the Pliocene.

11. **Mangilia quadricincta**, Suter, 1908, Plate 22, fig. 6.

Mangilia quadricincta, Suter, P. Mal. S., viii, 1908, 187, pl. 7, f. 21.

Shell very small, fusiform, thin and fragile, white, semitransparent, turriculate, clathrate. *Sculpture:* The first whorl below the smooth protoconch has a fine spiral cord on the sharp angle of the shoulder, the following a second below the carina, and the body-whorl has 4 cords, of which the two lower ones are close together and in front of the upper part of the aperture; they are crossed by equidistant straight thin axial riblets, about 18 on the last whorl, extending over the greater part of the base, the interspaces much broader than the riblets and ornamented with very fine growth-lines. *Colour* white. *Spire* conic, gradate, but little higher than the aperture. *Protoconch* of $1\frac{1}{4}$ smooth convex whorls, the nucleus globose and oblique. *Whorls* 4, shouldered and prominently keeled, straight above and below the keel; base contracted. *Suture* linear. *Aperture* somewhat oblique, pyriform, very broadly angled above, with an oblique, moderately long, open and truncated canal below. *Outer lip* strongly convex, lightly angled above, contracted below, crenated on the outside by the spirals, somewhat strengthened by the last

axial riblet ; sinus close to the suture, broad and shallow. *Columella* vertical, concave towards the parietal wall, slightly twisted, and drawn out to a narrow ridge towards the margin of the canal. *Inner lip* very thin, narrow, smooth, spread over the flat parietal wall.

Diameter, 2·1 mm. ; height, 4·4 mm.

Animal unknown.

Type in my collection.

Hab.—Near the Snares, in 50 fathoms (Captain Bollons).

Remark.—Allied to *M. murrhea* and *infanda*, Webst., both of which, however, have a spirally striate base and a short straight canal.

12. Mangilia Sinclairi, E. A. Smith, 1884. Plate 22, fig. 7.

Pleurotoma (*Mangilia*) *Sinclairi*, E. A. Smith, A.M.N.H. (5), xiv, 1884, 320. *Mangilia Sinclairi*, Suter, J. Mal., xii, 73. *Clathurella Sinclairi*, Smith : Hutton, P.L.S. N.S.W., x, 118 ; Suter, T.N.Z.I., xxxi, 73 ; Tryon, Man. Conch. (1), vi, 283, pl. 34, f. 91 ; Index, 71. *Daphnella* (*Mangelia*) *Letourneuxiana*, Crosse : Hutton, C.M.M., 12 ; not of Crosse. *Defrancia luteo-fasciata*, Reeve : Hutton, J. de Conch., xxvi, 17 ; M.N.Z.M., 45, not of Reeve.

Shell small, ovate, subturriculated, solid, axially costate and spirally lirate, usually with 2 brown spiral bands. *Sculpture* consisting of rounded and rather low axial ribs, 10 to 16 on the last whorl, the interstices of about the same width as the ribs, which are mostly obsolete on the very narrow shoulder or depression of the lower whorls, continued nearly to the base ; they are crossed by more or less distinct spiral liræ, continuous between and across the ribs, stouter upon the neck of the canal. *Colour* light flavescent, with 2 reddish or brown intercostal bands at the suture, the lower of them generally becoming very broad on the body-whorl, and extending to the margin of the flattish fasciole below ; very often these bands are absent, or the apex and the fasciole only are brown. *Spire* conic, scalar, somewhat higher than the aperture. *Protoconch* smooth, with a flatly rounded nucleus. *Whorls* 8, the earlier ones flattish, the others convex, with a narrow shoulder or depression ; base contracted. *Suture* impressed, undulating. *Aperture* oblique, narrowly ovate, angled above, produced below into a short broad canal, slightly oblique and not emarginate at the base. *Outer lip* strengthened by the last rib, flatly convex, sharp, with a shallow rounded sinus a little below the suture. *Columella* faintly arcuate, vertical, drawn out to a narrow ridge towards the canal. *Inner lip* smooth, thin, and narrow.

Diameter, 4·5 mm. ; height, 11 mm.

Animal unknown.

Type in the British Museum.

Hab.—Throughout New Zealand and at the Chatham Islands.

Remark.—This is a very variable shell, its height varying from 6 mm. to 13 mm., and the number of ribs from 10 to 16.

Fossil in the Pliocene.

13. Mangilia subaustralis, Suter, 1899. Plate 22, fig. 8.

Mangilia subaustralis, Suter, T.N.Z.I., xxxi, 1898 (1899), 72, pl. 3, f. 2.

Shell fusiform, white, turriculate, distinctly axially costate and with fine spiral threads, canal very narrow. *Sculpture* consisting of close straight rounded and prominent axial ribs, about 18 on the last whorl, the interstices of about the same width as the ribs, which are obsolete on the lower part of the base, flexed and less prominent on the shoulder; the surface crossed by equidistant spiral riblets, separated by linear grooves, rubbed off on the top of the ribs, much finer and dense on the shoulder. *Colour* yellowish-white. *Spire* conic, turreted, of the same height as the aperture. *Protoconch* of about 2 whorls, the nucleus smooth, convex, slightly lateral, the second whorl convex, and minutely reticulated. *Whorls* $6\frac{1}{2}$, distinctly shouldered, flatly rounded below the angle; base much narrowed. *Suture* impressed, submargined. *Aperture* oblique, very narrow, angled above, narrowed and drawn out to a short canal below, its base not notched. *Outer lip* thickened by the last rib, angled above, then moderately convex, with a shallow sinus below the suture. *Columella* vertical, straight, excavated on meeting the faintly convex parietal wall. *Inner lip* narrow and thin.

Diameter, 4·5 mm.; height, 11·5 mm.

Animal unknown.

Type in my collection.

Hab.—New Zealand, exact locality unknown.

Remark.—This shell is closely allied to *M. australis*, Ad. & Ang., from Australia and Tasmania, which, however, is usually larger, has the whorls but indistinctly shouldered, the aperture not angled above, and the anterior canal broader.

Genus 2. Daphnella, Hinds, 1844.

Daphnella, Hinds, in Belcher, Voy. "Sulphur," Mollusca, ii, 1844, 25.
Type: *Pleurotoma limnæiformis*, Kiener.

Shell rather small, thin, ovate, fusoid or bucciniform; spire conical, but moderately elevated; protoconch smooth, polygyrate, regularly conic, with a small and pointed nucleus; whorls convex, finely cancellated or reticulated, with a narrow shoulder, which is sometimes excavated; body-whorl very long, with a convex and but little attenuated base; aperture rather narrow, oval or subrhomboidal, produced below into a sometimes short wide canal, without emargination at its base; outer lip simple, convex, with a rounded and shallow sinus at the shoulder, generally dilated below in adult and perfect examples; columella excavated on meeting the parietal wall, slightly bent towards the left margin of the canal; inner lip thin, narrow, inconspicuous.

Distribution.—Warm seas.

Fossil in the Tertiary.

Key to Species.

A. Shell acicular or subulate.
  a. Fine spiral threads on the last whorl only ; shell acicular .. *acicula.*
  aa. Fine dense spiral lines on all the post-nuclear whorls ; shell subulate .. .. *tenuistriata.*
B. Shell more or less fusiform.
  a. Whorls distinctly shouldered.
    b. Height of spire almost equalling that of the aperture.
      c. Surface with axial sculpture.
        d. About 12 axial riblets and 2–3 keels on the spire-whorls ; protoconch microscopically reticulated .. .. .. *aculeata.*
        dd. Surface cancellated by axial and spiral riblets ; protoconch smooth .. .. *cancellata.*
      cc. Surface without axial sculpture. Spire-whorls with 4 sharp spiral threads .. .. *conquisita.*
    bb. Height of spire $1\frac{3}{4}$ that of the aperture. No axial sculpture ; spire-whorls with 4 strong spiral cords .. .. *crassilirata.*
  aa. Whorls not distinctly shouldered.
    b. Spire but little higher than the aperture.
      c. Spiral lines very fine.
        d. A few spiral liræ on the base ; height 3·5 mm. .. .. *amphipsila.*
        dd. Microscopic fine spiral lines on all post-nuclear whorls, body-whorl with about 20 spiral liræ, more distinct on base ; height 6 mm. .. .. .. *psila.*
      cc. Sharp spiral liræ, 5 on the penultimate whorl .. *chariessa.*
    bb. Height of spire $1\frac{1}{2}$ times that of the aperture. Spire-whorls with 3 fine spiral liræ, 10–12 on the body-whorl .. .. *totolirata.*

1. **Daphnella acicula**, Suter, 1908. Plate 22, fig. 9.

Daphnella acicula, Suter, P. Mal. S., viii, 1908, 189, pl. 7, f. 24.

Shell minute, acicular, the last whorl very high and spirally striate. *Sculpture* consisting of equal fine spiral threads with linear grooves between them, on the last whorl only, and more distinct on the base. *Colour* flavescent, the protoconch purple. *Spire* subcylindrical, slightly higher than the aperture, the outlines faintly convex. *Protoconch* comparatively large, papillate, of $1\frac{1}{2}$ smooth whorls, the nucleus oblique, broadly rounded. *Whorls* 4, the last two very rapidly increasing, faintly convex, very little attenuated towards the base. *Suture* linear. *Aperture* high, triangular, narrowly angled above, with a broad rudimentary canal below. *Outer lip* sharp, slightly thickened, somewhat convex, with a broad shallow sinus at the suture, thence advancing in a broad curve towards the base, smooth inside. *Columella* oblique, forming a straight line up and over the parietal wall. *Inner lip* very thin, inconspicuous.

Diameter, 1·3 mm. ; height, 3·6 mm.

Animal unknown.

Type in my collection.

Hab.—Near the Snares, in 50 fathoms (Captain Bollons).

2. **Daphnella aculeata,** Webster, 1906. Plate 22, fig. 10.

Daphnella aculeata, Webster, T.N.Z.I., xxxviii, 1905 (1906), 306, pl. 38, f. 4.

Shell fusiform, small, thin and fragile, turriculate, axially finely ribbed and spirally striate, buff-coloured. *Sculpture* consisting of axial slight diagonal ribs, about 12 on the last whorl, the interstices much wider than the riblets, and ornamented with fine growth-lines; crossed by 2 to 3 strong spiral keels on the spire-whorls, the first spiral below the shoulder being composed of 2 threads; body-whorl with about 13 sharp spirals, the upper six more distant than those on the base, and the crossing-points are raised into small gemmules. The interspaces between the spirals are microscopically spirally striate, the shoulder with crescent-shaped growth-lines. *Colour* buff, lighter towards the apex and canal. *Spire* conical, turreted, somewhat higher than the aperture. *Protoconch* of $1\frac{1}{4}$ whorls, convex, papillate, microscopically reticulated. *Whorls* 5, broadly shouldered, the shoulder somewhat concave, bicarinate below; body-whorl inflated, strongly contracted at the base. *Suture* deep at the protoconch, well marked further down. *Aperture* pyriform, broadly angled above, produced below into a straight short canal, truncated anteriorly. *Outer lip* thin and sharp, strongly convex and contracted below, with shallow rounded sinus at the suture. *Columella* straight, slightly twisted and bent to the left below; parietal wall straight, concave on meeting the columella. *Inner lip* very thin, the spiral riblets passing over it.

Diameter, 3·3 mm.; height, 6 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms.

3. **Daphnella amphipsila,** Suter, 1908. Plate 22, fig. 11.

Daphnella amphipsila, Suter, P. Mal. S., viii, 1908, 190, pl. 7, f. 26.

Shell very small, narrowly fusiform, thin, white, translucent, smooth. The *sculpture* consists of a number of spiral liræ on the base, and a few indistinct microscopic spiral lines on the whorls; growth-lines very fine and dense. *Colour* white, vitreous. *Spire* conic, a little higher than the aperture, outlines straight. *Protoconch* mamillary, of 2 smooth whorls, the nucleus minute, the succeeding whorl rather swollen. *Whorls* 5, regularly increasing, lightly convex, base contracted. *Suture* linear. *Aperture* subrhomboidal, the sides subparallel, angled above, produced below into a somewhat oblique, short but distinct, broad, and truncated canal. *Outer lip* moderately convex, straightened at the middle, contracted below, smooth inside. *Columella* straight, excavated towards the flat parietal wall, lightly curved below towards the margin of the canal. *Inner lip* thin and narrow, smooth.

Diameter, 1·6 mm.; height, 3·5 mm.

Animal unknown.

Type in my collection.

Hab.—Near the Snares, in 50 fathoms (Captain Bollons).

Remark.—The species is allied to *D. psila*, Sut., which is larger and has distinct spiral lines.

4. Daphnella cancellata, Hutton, 1878. Plate 46, fig. 28.

Daphnella cancellata, Hutton, J. de Conch., xxvi, 1878, 18; M.N.Z.M., 45; Suter, T.N.Z.I., xxxviii, 332. *Daphnella limneiformis*, Kiener: Hutton, P.L.S. N.S.W., x, 118; Suter, T.N.Z.I., xxxi, 75; Index, 71; not of Kiener.

Shell ovato-fusiform, rather thin, finely cancellated, whitish, with longitudinal zigzag bands of brown. *Sculpture* consisting of numerous close sharp spiral ridges, usually coarser and finer spirals alternating, cancellated by equidistant slightly flexuous axial sharp threads, arcuate on the narrow shoulder. *Colour* whitish, with zigzag axial bands of brown; on the spire-whorls white is predominant, brown on the body-whorl; protoconch rufous; aperture bluish-white within. *Spire* conic, turreted, outlines somewhat convex, of the same height as the aperture. *Protoconch* small, sharply conic, smooth. *Whorls* about 8, first slowly then rapidly increasing; spire-whorls lightly convex below the narrow and flattishly sloping shoulder; body-whorl moderately rounded, the base a little contracted. *Suture* superficial. *Aperture* high and rather narrow, narrowly angled above, with a short broad canal below, its base truncated. *Outer lip* vertical, very lightly convex, slightly contracted below, with a distinct broadly rounded sinus at the suture, produced forward in a curve below it; the edge sharp and finely crenate inside. *Columella* slightly concave, turned to the left below; excavated on meeting the faintly convex parietal wall. *Inner lip* thin and narrow, some of the lower spirals passing over it.

Diameter, 5 mm.; height, 12·7 mm. (type). Diameter, 8 mm.; height, 22 mm. (adult specimen).

Animal unknown.

Type in the Otago Museum, Dunedin.

Hab.—Auckland Harbour, living specimens occasionally thrown up after storms (T. F. Cheeseman), type; Stewart Island.

Fossil in the Pliocene.

5. Daphnella chariessa, Suter, 1908. Plate 22, fig. 12.

Daphnella chariessa, Suter, T.N.Z.I., xl, 1907 (1908), 351, pl. 27, f. 9.

Shell very small, fusiform, thin and fragile, spirally lirate, white. *Sculpture* consisting of narrow sharply elevated spiral lirae below the protoconch, 4 on the third and fourth, 5 on the penultimate whorl, and about 14 on the body-whorl, the interstices slightly broader than the lirae, and ornamented with fine dense straight growth-lines. *Colour* white. *Spire* elevated conic, a little higher than the aperture;

outlines almost straight. *Protoconch* papillate, of 2 smooth lightly convex whorls, the second high. *Whorls* 5, regularly increasing, moderately convex, indistinctly flattened below the suture; base slightly contracted. *Suture* impressed, but not deep. *Aperture* a little oblique, high and narrow, sides subparallel, rounded above, with a short widely open and truncated canal below. *Outer lip* thin and sharp, slightly angled above, straight in the middle, and oblique below, denticulated on the outside by the spiral riblets; sinus just below the suture, broadly rounded, not deep. *Columella* subvertical, smooth, almost straight, turned to the left towards the canal below. *Inner lip* thin and very narrow, spreading over the slightly excavated parietal wall.

Diameter, 1·7 mm.; height, 4·5 mm.

Animal unknown.

Type in my collection.

Hab.—Five miles south of Cuvier Island, in 38 fathoms; near the Snares, in 50 fathoms (Captain Bollons).

6. **Daphnella conquisita,** Suter, 1907. Plate 22, fig. 13.

Daphnella conquisita, Suter, T.N.Z.I., xxxix, 253, pl. 9, f. 1.

Shell small, fusiform, thin, fragile, semitransparent, spirally lirate. *Sculpture* consisting of narrow sharply rounded and elevated spiral ribs, narrower than the grooves, 4 on the spire-whorls, 10 on the body-whorl, the interspaces axially microscopically finely striate. *Colour* light fulvous. *Spire* elevated, higher than the aperture. *Protoconch* of 2 smooth and convex whorls. *Whorls* 6, regularly increasing, slightly shouldered, flatly convex, base contracted. *Suture* impressed and margined below by a small thread on the penultimate whorl only. *Aperture* oblong-oval, margins nearly parallel, produced below into an open slightly flexuous canal, truncated at the base; sinus obsolete. *Outer lip* sharp, smooth inside, convex above, concave on the canal. *Columella* sinuous, slightly produced in the middle, without any callosity.

Diameter, 2·2 mm.; height, 6 mm.

Animal unknown.

Type in the Dominion Museum.

Hab.—Near Channel Island, Hauraki Gulf, in 25 fathoms; near Cuvier Island, in 38 fathoms (Captain Bollons).

Remarks.—A very well characterized species, in sculpture approaching *D. lacunosa,* Hutt., which, however, has smooth grooves.

7. **Daphnella crassilirata,** Suter, 1908. Plate 22, fig. 14.

Daphnella crassilirata, Suter, P. Mal. S., viii, 1908, 190, pl. 7, f. 27.

Shell very small, elongate-fusiform, white, with stout spiral cords, turriculate. *Sculpture:* The protoconch, the shoulder on the following whorls, and the base are smooth, the lower spire-whorls have 4

strong spiral cords, separated by very narrow interstices, the uppermost forming the angle of the narrow and but little sloping shoulder; body-whorl with 6 or 7 spiral cords, the greater part of the base in front of the aperture smooth; growth-lines fine. *Colour* white. *Spire* elevated, conic, turriculate, $1\frac{3}{4}$ times the height of the aperture. *Protoconch* papillate, of $1\frac{1}{2}$ smooth and convex whorls. *Whorls* $4\frac{1}{2}$, rather rapidly increasing, narrowly and flatly shouldered, convex below; base slightly contracted. *Suture* linear. *Aperture* broadly oval, angularly rounded above, with a broad short canal, which often is wanting, faintly emarginate at the base. *Outer lip* slightly angled above, straightened at the middle, rounded or contracted below, smooth inside. *Columella* vertical, excavated towards the lightly concave parietal wall, somewhat bent to the left below. *Inner lip* thin and narrow.

Diameter, 1·5 mm.; height, 3·2 mm.

Animal unknown.

Type in my collection.

Hab.—Near the Snares, in 50 fathoms, type (Captain Bollons); Stewart Island, in 15 fathoms (A. Hamilton); twenty-three miles north of Wreck Reef, Stewart Island, in 50 to 54 fathoms (Edgar R. Waite).

Remarks.—The species may be at once distinguished from the nearly allied *D. totolirata* and *chariessa*, Sut., by the stout spirals with linear interstices.

8. **Daphnella psila,** Suter, 1908. Plate 22, fig. 15.

Daphnella psila, Suter, T.N.Z.I., xl, 1907 (1908), 352, pl. 27, f. 10.

Shell very small, fusiform, thin, almost smooth, but the base distinctly spirally striate. *Sculpture:* Excessively fine microscopic spiral striæ are present on all whorls, those of the protoconch excepted, crossed by fine dense straight growth-lines; the body-whorl with broad flat equidistant spiral ribs, numbering about 20, with narrow linear interstices; they are distinct on the base, but more or less effaced on the upper part of the whorl. *Colour* light yellowish-white. *Spire* elevated conic, with a blunt apex, a little higher than the aperture; outlines straight. *Protoconch* of $1\frac{1}{2}$ smooth and polished whorls, the nucleus broadly rounded. *Whorls* 5, regularly increasing, very flatly convex; base lightly contracted. *Suture* moderately impressed. *Aperture* slightly oblique, high and narrow, sides subparallel, angled above, with a short broad and truncated canal below. *Outer lip* thin and sharp, gently curved above, broadly rounded below. *Columella* vertical, smooth, straight, bent to the left below. *Inner lip* very narrow, extending over the lightly excavated parietal wall.

Diameter, 2·6 mm.; height, 6 mm.

Animal unknown.

Type in my collection.

Hab.—Five miles south of Cuvier Island, in 38 fathoms (Captain Bollons).

9. **Daphnella tenuistriata,** Suter, 1908. Plate 22, fig. 16.

Daphnella tenuistriata, Suter, P. Mal. S., viii, 1908, 190, pl. 7, f. 25.

Shell very small, subulate, thin and fragile, minutely spirally striate. *Sculpture* consisting of very fine dense and equal spiral striæ from the protoconch down to the base, the former most likely smooth. *Colour* flavescent to fulvous, the protoconch purple. *Spire* elevated conic, somewhat higher than the aperture, outlines faintly convex. *Protoconch* broken off in all the four specimens at my disposal. *Whorls* 5 to 6, lightly convex, rather rapidly increasing; base contracted. *Suture* linear, well impressed. *Aperture* subrhomboidal, the sides parallel, angled above, with a short broad and slightly emarginate canal below. *Outer lip* moderately convex, acutely curved, and sometimes a little contracted below, sharp, with a shallow broad sinus below the suture. *Columella* vertical, straight, excavated on meeting the faintly convex parietal wall. *Inner lip* thin and very narrow.

Diameter, 2 mm.; height of three whorls without protoconch, 5 mm.: the height of the perfect shell may be about 6 mm.

Animal unknown.

Type in my collection.

Hab.—Near the Snares, in 50 fathoms (Captain Bollons).

Remarks.—Although none of the specimens are quite perfect, I do not hesitate to describe this elegant species, especially as there is no prospect of getting more material in the near future. One specimen has part of the protoconch left, showing its colour and smoothness. It is nearly related to *D. acicula,* Sut., but is larger, the sculpture extending not only over the body-whorl, and the canal more distinct.

10. **Daphnella totolirata,** Suter, 1908. Plate 22, fig. 17.

Daphnella totolirata, Suter, P. Mal. S., viii, 1908, 189, pl. 7, f. 23. *D. lacunosa* Hutton: Suter, T.N.Z.I., xxxi, 1899, 75; not of Hutton.

Shell minute, narrowly fusiform, thin, semitransparent, spirally lirate. *Sculpture:* The protoconch is microscopically finely spirally striate, the succeeding whorls have 3 and the body-whorl 10 to 12 equidistant fine spiral liræ, the interstices smooth and slightly broader than the threads. *Colour* white. *Spire* narrowly conical, about $1\frac{1}{2}$ times the height of the aperture. *Protoconch* of $1\frac{1}{2}$ convex whorls, the nucleus narrowly rounded, oblique. *Whorls* 4 to 5, regularly increasing, lightly convex, somewhat flattened below the suture; base slightly contracted. *Suture* not much impressed. *Aperture* high and narrow, angled above, with a very short broad and truncated canal below. *Outer lip* convex, straightened below the suture, with a very shallow broad sinus at the suture, smooth inside, crenated on the outside by

spiral sculpture, thin and sharp. *Columella* vertical, straight, lightly excavated toward the flat parietal wall. *Inner lip* very thin and narrow, smooth.

Diameter, 1·1 mm. ; height, 2·8 mm., with 5 whorls.

Animal unknown.

Type in my collection.

Hab.—Foveaux Strait, in 15 fathoms, type (A. Hamilton) ; Whangaroa Harbour (C. Traill) ; near the Snares, in 50 fathoms (Captain Bollons) ; Chatham Islands.

Remarks.—This species, no doubt, is in form and sculpture very much like *D. lacunosa*, Hutt., but the fossil form is nearly twice as high (5 mm.), and there is no evidence that the protoconch is striate. I therefore consider it advisable to make the Recent form the type of a new species. It is much smaller than the also nearly allied *D. chariessa*, Sut., which has more spirals on a whorl, and a much higher and smooth protoconch.

Subgen. 1. Thesbia, Jeffreys, 1867.

Type : *T. nana*, Lovén.

Shell small, bucciniform ; spire short, subconoidal ; protoconch paucispiral, globose, nucleus papillate ; whorls convex, smooth, the last relatively very large, the base gradually narrowed ; aperture ovate, contracted below, terminating in a short truncated and straight canal ; sinus on the outer lip very small ; columella slightly sinuous ; inner lip thin, narrow.

Key to Species.

A. Whorls convex	*membranacea.*
B. Whorls angulated	*xanthias.*

11. Daphnella membranacea, Watson, 1886. Plate 22, fig. 18.

Pleurotoma (*Thesbia*) *membranacea*, Wats., Chall. Rep., xv, 333, pl. 26, f. 9.
Daphnella membranacea, Suter, T.N.Z.I., xxxi, 77 ; Index, 71.

Shell broad and short, tumid, membranaceously thin, feebly spiralled, white, base long and gradually contracted. *Sculpture* consisting of very slight impressed lines and flat feeble spiral threadlets, which are irregular and interrupted at every biggish line of growth, feebler, broader, and more regular just below the suture. *Colour* white, under a brownish-yellow smooth glossy thin epidermis, entirely translucent. *Spire* short-pointed, conical, not much higher than half the height of the aperture. *Protoconch* eroded, evidently small. *Whorls* 5 remaining ; they are short, broadish, a little tumid, convex ; the last is large, tumid, and elongated, drawn out at the base. *Suture* distinct, linear, and slight. *Aperture* semilunar, sharply angulated above and below, the canal broad but somewhat broken. *Outer lip* very thin, regularly curved, with a deep wide sinus close up to the suture, whence the front edge of the shell makes a prodigious forward and

downward sweep, then retreating again. *Columella* straight, slightly oblique, twisted below, the sharp edge forming a sharp point below. *Inner lip* inconspicuous. (Watson.)

Diameter, 13·5 mm. ; height, 22 mm.

Animal unknown.

Type in the British Museum.

Hab.—Off Cape Turnagain, in 1,100 fathoms (" Challenger ").

12. **Daphnella xanthias,** Watson, 1886. Plate 22, fig. 19.

Pleurotoma (Thesbia) xanthias, Wats., Chall. Rep., xv, 334, pl. 26, f. 10.
Daphnella xanthias, Suter, T.N.Z.I., xxxi, 77 ; Index, 71.

Shell oval, biconical, feebly spiralled, white. *Sculpture* consisting of numerous flat threads, parted by slight irregular lines, below the blunt carination in the middle of the whorls, the upper part being smooth ; growth-lines fine, slightly puckered below the suture. *Colour* white, glossy. *Spire* high, conical, its height somewhat less than that of the aperture. *Protoconch* has probably 3 to 3½ whorls, but the apex is lost and only 2 remain, microscopically scored by minute straight lines, sloping obliquely to the left below. *Whorls* 4½, below the apical nucleus ; feebly angulated in the middle, the last large, gradually narrowed at the base. *Aperture* narrowly oblong, pointed above, without a canal below. *Outer lip* thin, flatly arched, with a deep broad sinus, close up to the suture ; below the sinus the edge of the lip swings forward in a great wing-like curve. *Columella* long, subvertical, slightly truncate below. *Inner lip* inconspicuous. (Watson.)

Diameter, 10·2 mm. ; height, 19·5 mm.

Animal unknown.

Type in the British Museum.

Hab.—Off Cape Turnagain, in 1,100 fathoms (" Challenger ").

Fam. **TEREBRIDÆ,** Adams.

Animal having the foot rounded in front, elongated behind ; head rather large, with short small tentacles furnished with eyes at their tips ; between the tentacles extends anteriorly a rather long cylindrical trunk. Teeth of radula subulate, arcuate, in two lateral rows ; formula 1+0+1.

Shell long, solid, narrow, many-whorled, whorls flattened, suture superficial ; aperture small, notched below ; columella without plaits. Operculum horny, annular, with apical nucleus.

Distribution.—Tropical and subtropical. About 200 species.

Fossil in the Tertiary, commencing with the Eocene.

Genus 1. TEREBRA, Lamarck, 1799.

Terebra, Lamarck, Mém. Soc. Hist. Nat. Paris, 1799, 71. Type : *Buccinum subulatum,* L. *Terebrum,* Montfort, 1810.

Shell subulate, narrow ; protoconch smooth, conoidal, with a deviated nucleus ; spire very high, pointed, many-whorled, generally

with a sutural band which does not correspond with a labial sinus ; aperture short, distinctly channelled above, and deeply notched at the base ; outer lip thin ; columella smooth, inflexed below, ending in a point, and an elevated border alongside the canal ; inner lip thin, not callous, from underneath it arises a narrow rib which encircles the beak, limiting the growth-lines of the basal emargination, and terminating at the angle of the outer lip.

The species are inhabitants of shallow water principally ; most of them have been obtained in depths of from 10 to 25 fathoms, but one species was dredged in about 100 fathoms.

Vernacular Name.—Auger-shells.

Key to Species.

a. Spire-whorls with inequidistant, flatly rounded, flexuous axial plications ; no peripheral band on the body-whorl .. *flexicostata.*

aa. Spire-whorls with equidistant, sharply rounded, nearly straight riblets ; body-whorl with peripheral band .. .. *tristis.*

1. Terebra flexicostata, Suter, 1909. Plate 22, fig. 20.

Terebra flexicostata, Sut., P. Mal. S., viii, 1909, 255, pl. 11, f. 8.

Shell subulate, axially flexuously plicate, shining, brown, with a pale band below the suture. *Sculpture* consisting of irregularly spaced flexuous flatly rounded axial plications, obsolete on the body-whorl, the interstices with fine growth-lines ; indistinct fine microscopic spiral striæ are present. *Colour* fulvous or flamed with fulvous and white, a light-brown or white band below the suture, no peripheral band on the body-whorl. *Spire* high, angle about 20°. *Protoconch* smooth, conical. *Whorls* about 10, first slowly then more rapidly increasing, very flatly convex ; base rounded, somewhat contracted above the basal rib. *Suture* impressed. *Aperture* subvertical, narrowly oval, with a short and rather narrow canal, narrowly notched below. *Outer lip* broadly convex, sharp. *Columella* subvertical, lightly convex, narrowly drawn out to a point at the base of the canal ; somewhat excavated on joining the flat parietal wall above. *Inner lip* thin and narrow. *Operculum* unknown.

Diameter, 5 mm. ; height, 18·5 mm.

Animal unknown.

Type in my collection.

Hab.—Cape Maria van Diemen (Captain Bollons) ; Port Waikato (W. H. Webster).

Remarks.—The *T. venosa* reported as having been found at Port Waikato by Mr. W. H. Webster is no doubt *T. flexicostata*. The species is allied to the Australian *T. Brazieri*, Angas, but the whorls are flatter, the riblets straighter, and the spire is more slowly tapering.

2. Terebra tristis, Deshayes, 1859. Plate 46, fig. 29.

Terebra tristis, Deshayes, P.Z.S., 1859, 306; Conch. Icon., xii, f. 102; Man. Conch. (1), vii, 36, pl. 10, f. 100; Hutton, P.L.S. N.S.W., x, 118. *Terebra antarctica*, E. A. Smith, A.M.N.H., xi, 1873, 270. *Cerithium Kirki*, Hutton, C.M.M., 1873, 27. *Acus Kirki*, Hutton, M.N.Z.M., 42.

Shell rather small, subulate, axially plicate, grey or brown, with a yellow band above the suture and below the periphery of the body-whorl. *Sculpture* consisting of arcuate equidistant sharply rounded riblets, flexuous on the last whorl, the interstices broader than the costæ, of which there are about 16 on the body-whorl; the interstices have fine and dense growth-lines, which are crossed by more or less distinct fine spiral striæ. *Colour* chocolate, with a light-yellow spiral band above the suture, continued on the body-whorl below the periphery; sometimes the colour is greyish-white or yellowish-brown. *Spire* high, narrowly conic, sharply pointed, about $2\frac{1}{2}$ times the height of the aperture. *Protoconch* small, smooth, nucleus rounded and lightly deviated. *Whorls* 10, regularly increasing, somewhat convex; body-whorl convex, contracted above the spiral rib on the base. *Suture* impressed, somewhat undulating. *Aperture* oblique, oval, lightly channelled, with a very short broad canal below, its base broadly emarginate. *Outer lip* regularly convex, sharp. *Columella* subvertical, bent to the left below, continued as a narrow ridge to the base of the canal; excavated on joining the faintly convex parietal wall. *Inner lip* narrow and very thin, usually distinctly bounded. *Operculum* unknown.

Diameter, 6 mm.; height, 19 mm. (type).

Animal unknown.

Type in the British Museum.

Hab.—Throughout New Zealand. Bay of Islands (Anderson); Whangarei Heads (C. Cooper); Hauraki Gulf (H. S.); off Wanganui, in 20 fathoms; Banks Peninsula (Iredale).

Fossil in the Pliocene.

Subsp. crassicostata, Suter, 1909.

Terebra tristis crassicostata, Sut., P. Mal. S., viii, 1909, 255.

Distinguished from the species by the following characters: the shell is much smaller, the axial costæ are stouter, broadly rounded, of the same width as the interstices; fine spiral striæ are also present. Colour yellowish-white, a light-brown band below the suture, and a white band below the periphery, arising from the suture, base fulvous.

Diameter, 3·5 mm.; height, 10 mm.

Type in my collection.

Hab.—Lyall Bay (Miss Mestayer).

Subclass II. **EUTHYNEURA,** Spengel.

(*Platymalakia,* von Ihering. *Androgyna,* Mörch.)

These are hermaphrodite *Gastropoda,* whose radula is generally composed of uniform teeth on each side of the median tooth. The head in most cases bears 2 pairs of tentacles ; in *Athoracophorus* and a few other genera, however, there is only a single pair. The *Euthyneura* are specially characterized by the detorsion of their organization when adult ; this detorsion is particularly well manifested in the visceral commissure, which is no longer twisted, except in some archaic forms of Tectibranchs and Pulmonates, and shows a tendency to the concentration of all its elements round the œsophagus. To such a degree is this concentration carried that, with the exception of the *Bullomorpha* and of *Tethys,* the whole central nervous system is aggregated on the dorsal or ventral side in the cephalic region.

The subclass includes the two orders *Opisthobranchia* and *Pulmonata.*

Order 1. **OPISTHOBRANCHIA,** Milne-Edwards.

Marine *Euthyneura* with aquatic respiration ; the more archaic forms have a relatively large foot and small visceral hump, from the base of which projects, on the right side, a short mantle-skirt. The anus is placed in such forms far back beyond the mantle-skirt. In front of the anus, and only partly covered by the mantle-skirt, is the ctenidium, with its free end turned backwards. The heart, with the ventricle generally anterior, lies in front of, instead of to the side of, the attachment of the ctenidium. A shell is possessed in the adult state by but few *Opisthobranchia,* but all pass through a veliger larval stage with a nautiloid shell. Many *Opisthobranchia* have by a process of atrophy lost the typical ctenidium and the mantle-skirt, and have developed other organs in their place. The free margin of the mantle-skirt is frequently reflected over the shell when a shell exists ; and broad lateral outgrowths of the foot (epipodia), which may be thrown over the shell or naked dorsal surface of the body.

The order comprises two suborders, *Tectibranchia* and *Nudibranchia.*

Suborder 1. TECTIBRANCHIA, Cuvier.

Opisthobranchs provided in the adult state with a mantle and a shell, with the exceptions of *Runcina, Pleurobranchæa,* the *Cymbuliidæ,* and some *Aplysiomorpha.* There is a ctenidium, except in some *Thecosomata* and *Gymnosomata,* and an osphradium.

The suborder includes three tribes—the *Bullomorpha,* the *Aplysiomorpha,* and the *Pleurobranchomorpha.*

Tribe 1. BULLOMORPHA.

In these Tectibranchs the shell is usually well developed (it is wanting in *Runcina* and the *Cymbuliida*), and may be external or

internal. There is no operculum except in the *Acteonidæ* and *Limacinidæ*. The pallial cavity is always well developed, and contains the ctenidium, in part at least; this ctenidium is of the "folded" type. With the exception of the *Aplustridæ* and *Thecosomata*, the head is devoid of apparent tentacles, and its dorsal surface forms a digging disc or shield, usually separate from the neck, and with more or less scalloped margins. The edges of the foot (parapodia) are continuous with the ventral face of that organ, and are often transformed into highly developed fins. Posteriorly the mantle forms a large "pallial lobe" under the pallial aperture. The stomach is generally provided with chitinous, or even calcified, masticatory plates. The hermaphrodite genital aperture is connected with the male organ by a ciliated groove, except in *Acteon*, *Lobiger*, and *Cavolina longirostris*, in which the spermiduct is a closed tube. The *Bullomorpha* are swimmers or burrowers.

Fam. **ACTEONIDÆ**, Dall.

Animal having a well-developed head-disc, bearing the sessile eyes, and prolonged into triangular processes behind; lateral epipodial lobes not developed. Radula composed of many longitudinal rows of teeth, all of the same form.

Shell entirely external, and capable of containing the entire animal; spiral, with projecting or depressed spire and moderately numerous whorls, the internal whorl-partitions not absorbed; surface generally sculptured with spiral punctured grooves; aperture rounded below, with or without columellar folds. Operculum present.

Key to Genera.

A. Columella with a spiral fold.
  a. Shell compact, solid, ovoid, with a short spire; aperture long, narrow above; the columella bearing a massive bifid fold .. .. Pupa.
  aa. Shell compact, with short spire and large ovate body-whorl; aperture over half the height of the shell, narrowed above; the columella bearing a single simple spiral fold .. .. Acteon.
  aaa. Shell ovate or ovate-turreted, the spire produced; aperture short, generally less than half the shell's height, ovate or oblong; columella with a small oblique fold .. Leucotina.
B. Columella with no distinct spiral fold above; shell imperforate, or nearly so.
  a. Shell ovate or oblong, with short spire and long aperture; columella vertical, truncated at the base .. .. Bullina.

Genus 1. Acteon, Montfort, 1810.

Acteon, Montf., Conch. Syst., ii, 314. Type: *A. tornatilis*, L. *Actæon*, A. Adams, P.Z.S., 1854, 58; not *Actæon*, Oken, 1815. *Tornatella*, Lamarck, Extr. du Cours de Zool. Mus. Nat. Hist., 1812, 117. *Speo*, Risso, Hist. Nat. Eur. Mérid., iv, 1826, 235. *Kanilla*, Silvertrop, 1838. *Myesota*, Gray, 1847.

Animal having the cephalic shield squared in front, produced behind in 2 triangular appendages, in front of the bases of which the

eyes are situated. Radula wide, with many longitudinal rows of teeth, all of the same form, consisting of a narrow basal plate and a crescentic reflexion.

Shell oval, spirally striate, with conical spire and impressed or channelled suture; aperture long, half the shell's height or more, narrow above, broadly rounded below, the outer lip simple and acute; columella twisted into a strong simple spiral fold; parietal wall without folds or teeth. Operculum corneous, shaped like the aperture, few-whorled, with the nucleus near the basal margin.

Distribution.— World-wide.

Fossil from the Upper Cretaceous.

1. Acteon craticulatus, Murdoch and Suter, 1906. Plate 22, fig. 21.

Actæon craticulatus, M. & S., T.N.Z.I., xxxviii, 1905 (1906), 281, pl. 21, f. 6.

Shell small, oval, whitish, subperforate, cancellated, with a basal fold upon the columella. *Sculpture* consisting of well-impressed spiral grooves of rather irregular width, with interstices of nearly the same breadth, though in some specimens they are distinctly broader. This spiral sculpture is very variable. There are subequidistant axial threads cutting up the spiral furrows into oblong squares. *Colour* of most specimens (all dead shells) white; a few specimens only show purple coloration on the body-whorl, leaving a white band below the suture. *Spire* conical, acuminate, less than half the height of the shell. *Protoeonch* paucispiral, not distinctly separated from the succeeding whorl, lightly corroded in most specimens, nucleus small. *Whorls* 5, the last of considerable size, slightly angled above, flatly convex; base narrowed and rounded. *Suture* deep, distinctly canaliculate. *Aperture* subvertical, elongated pyriform, produced at the base. *Outer lip* sharp, very little convex, nearly straight, minutely denticulate, sharply rounded at the base. *Columella* with a moderately large smooth plait situated at the lower third, slightly excavated above, reaching the effuse basal lip in a light curve. *Inner lip* narrow, thin. *Operculum* unknown.

Diameter, 4·5 mm.; height, 9 mm.; aperture, 2 mm. by 5·5 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms; near Cuvier Island, in 37 and 44 fathoms (Captain Bollons).

Genus 2. Pupa, Bolten, 1798.

Pupa, Bolten, Mus. Bolten. (2), 1798, 110. Type: *Voluta solidula*, L. *Solidula*, Fischer de Waldheim, 1807. *Dactylus*, Schumacher, 1817. *Buccinulus*, H. and A. Adams, 1858. *Tornatella* of authors.

Anatomy and dentition unknown.

Shell ovate or oblong, solid, compact and imperforate, with short conical spire; aperture two-thirds as high as the shell or more, narrow

above, rounded below, the columella bearing a massive bilobed spiral fold, outwardly curving into the lower margin of the peristome; parietal wall bearing one or more smaller folds. Operculum transverse, elongated, curved, with imbricate elements and a linear scar.

Distribution.—Subtropical and southern temperate Indo-Pacific seas; a few species extending northward to Japan, and others south to South Australia and New Zealand.

Fossil in the Tertiary.

KEY TO SPECIES.

A. Height of spire about half that of the aperture. Sculptured with distant spiral grooves, the interstices broader; whitish, sometimes tessellated with blackish .. .. *affinis.*

B. Height of spire nearly the same as that of the aperture.

a. Sculptured with numerous somewhat unequal liræ, the interstices of the same width .. .. *alba.*

aa. Sculptured with crenate spiral grooves, the interspaces broader; spirals close together on the base .. .. *gracilis.*

1. **Pupa affinis**, A. Adams, 1855. Plate 22, fig. 22.

Solidula affinis, A. Adams, P.Z.S., 1854 (1855), 61. *Buccinulus affinis*, A. Ad.: Angas, P.Z.S., 1867, 225. *Actæon* (*Buccinulus*) *affinis*, A. Ad., Chall. Rep., xv, 630, pl. 47, f. 3. *Solidula affinis*, A. Ad., Man. Conch. (1), xv, 141, pl. 20a, f. 52. *Buccinulus Kirki*, Hutton, C.M.M., 51. *Actæon Kirki*, Hutt., Index, 69. *Solidula Kirki*, Hutt., Man. Conch. (1), xv, 146. *Buccinulus Huttoni*, T. W. Kirk, T.N.Z.I., xiv, 1881 (1882), 268. *Solidula Huttoni*, Kirk, Man. Conch. (1), xv, 147; Index, 70.

Shell cylindrical ovate, solid, whitish, tessellated with blackish spots, spirally sulcate. *Sculpture* consisting of unequal rather distant spiral grooves, 5 to 7 on the penultimate whorl, crenulated by growth-lines; the interstices broader than the grooves, sometimes very broad at the periphery of the last whorl, quite flat, striated by fine growth-lines. *Colour* white or buff-white, frequently variedly painted, tessellated with subquadrate irregular blackish spots. *Spire* conical, with a sharp apex, about half the height of the aperture; outlines lightly convex. *Protoconch* minute, of 1½ smooth whorls. *Whorls* about 7, first slowly increasing, flattened, the last high; base moderately convex. *Suture* linear. *Aperture* narrowly pyriform, very narrow above, broader and rounded below. *Outer lip* straight at the middle, solid, but with a sharp edge; basal lip convex, sometimes considerably produced. *Columella* with a stout oblique lightly bifid plait, separated from the parietal wall by a narrow deep groove; on the lower part of the convex parietal wall a fine rather inconspicuous ridge. *Inner lip* rather thick, extending over the parietal wall. *Operculum* unknown.

Diameter, 6·5 mm.; height, 14 mm.

Animal unknown.

Type in the British Museum. The types of *S. Kirki* and *Huttoni* are in the Dominion Museum, Wellington.

Hab.—North Island of New Zealand: Whangaroa Harbour; Bay of Islands; Omaha, type of *S. Kirki* (T. Kirk); Waikanae, type of *S. Huttoni* (T. W. Kirk).

The species has a very wide distribution: China Seas; New Ireland; Borneo; Philippines (Cuming); Port Jackson ("Challenger"); Darnley Island, Torres Strait (Brazier); Moonta Bay, South Australia (Tate), according to the Man. Conch.

2. **Pupa alba**, Hutton, 1873. Plate 22, fig. 23.

Buccinulus albus, Hutt., C.M.M., 51; J. de Conch., 1878, 40; M.N.Z.M., 119. *Tornatella alba*, Hutt., Plioc. M., 37, pl. 6, f. 2. *Solidula alba*, Hutt., Man. Conch. (1), xv, 146, pl. 18, f. 94; Harris, C. Tert. M.B.M., i, 8; Index, 69; Murdoch and Suter, T.N.Z.I., xxxviii, 281.

Shell elongately ovate, white, finely spirally lirate, the interstices with fine axial threads. *Sculpture* consisting of numerous somewhat unequal flat spiral liræ, the interstices of about the same width, ornamented with axial fine threads. *Colour* white. *Spire* conic, a little lower than the height of the aperture; outlines slightly convex. *Protoconch* minute, of $1\frac{1}{4}$ smooth whorls, the nucleus somewhat tilted. *Whorls* 7, first slowly increasing, the last very large, flattish; base flatly convex. *Suture* distinct, not deep. *Aperture* subpyriform, very narrow above, widened and rounded below. *Outer lip* vertical, thin and sharp. *Basal lip* regularly rounded. *Columella* with a strong oblique lightly bifid fold, with a narrow deep groove towards the convex parietal wall, which bears a fine sharp spiral fold on its lower part. *Inner lip* distinct, narrow, well limited, extending over the parietal wall. *Operculum* unknown.

Diameter, 3·8 mm.; height, 9 mm. (type). Diameter, 5·5 mm.; height, 12 mm.

Animal unknown.

Type lost.

Hab.—Hauraki Gulf; off Great Barrier Island, in 110 fathoms; five miles south of Cuvier Island, in 38 fathoms (Captain Bollons); Stewart Island.

Fossil in the Pliocene.

3. **Pupa gracilis**, T. W. Kirk, 1882. Plate 22, fig. 24.

Buccinulus gracilis, T. W. Kirk, T.N.Z.I., xiv, 1881 (1882), 268. *Solidula gracilis*, T. W. Kirk, Man. Conch. (1), xv, 146; Index, 70.

Shell elongately oval, rather thin, with a high spire, white, spirally sulcated. *Sculpture* consisting of crenate spiral grooves, nearly equidistant on the spire-whorls, 6 on the penultimate whorl, the interspaces much broader and flat; on the body-whorl they are subequidistant on the first half of the volution, but on the second half the median interspaces are becoming grooved, giving that part of the shell a finely spirally grooved appearance; at the base again the grooves are closer together; the whole of this sculpture is crossed by

fine flexuous growth-lines. *Colour* white. *Spire* high, conic, nearly as high as the aperture; outlines nearly straight. *Protoconch* very small, of 2 smooth whorls. *Whorls* 8, regularly increasing, flattish, the body-whorl somewhat constricted in the middle; base flattened. *Suture* well impressed. *Aperture* very narrow and sharply angled above, widened below, rounded and slightly effuse at the base. *Outer lip* nearly straight, thin and sharp, faintly concave at the middle; basal lip regularly convex. *Columella* with a stout oblique lightly bifid plait, curving off to the basal lip; separated from the convex body-whorl by a distinct groove, which contains a low oblique fold; parietal wall with an inconspicuous ridge at its lower part. *Inner lip* narrow, distinctly bounded, extending over the parietal wall. *Operculum* unknown.

Diameter, 8 mm.; height, 20 mm. (type).

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Wellington (C. Holdsworth).

Genus 3. Leucotina. A. Adams, 1860.

Leucotina, A. Adams, A.M.N.H. (3), v, 1860, 406. Type: *L. niphonensis*, A. Ad. *Myonia*, A. Adams, 1860; not of Dana, 1847. *Monoptygma*, A. Adams, 1851; not of Lea.

Animal unknown.

Shell ovate or elongated, usually rimate, thin, whitish, with convex whorls; sculptured with spiral punctured or subpunctate grooves; aperture rather small, oblong, produced and rounded below, the outer lip simple or crenulated within; columella with one small oblique fold.

Distribution.—Most of the species are from the coasts of Japan and China.

1. **Leucotina pura**, A. Adams, 1855. Plate 22, fig. 25.

Monoptygma pura, A. Ad., in Thes. Conch., ii, 1855, 820, pl. 172, f. 33. *Leucotina pura*, A. Ad., Man. Conch. (1), xv, 172. *Pyramidella* (*Actæopyramis*) *pura*, A. Ad., Man. Conch. (1), viii, 314, pl. 74, f. 49.

Shell rather solid, white; whorls somewhat convex, spirally grooved, intermediate liræ smooth, grooves longitudinally striated. Height, 9 mm.

Type in the British Museum.

Hab.—New Zealand.

I have not seen this shell.

Genus 4. Bullina, Férussac, 1821.

Bullina, Férussac, Tabl. Syst., p. xxx, 1821. Type: *Bulla scabra*, Gmelin. *Bullinula* (Beck), Swainson, "Malacology," 1840, 360.

Shell oval, generally rimate, with short projecting spire, sinistral apex, and large swollen body-whorl; rather thin, spirally punctate-

grooved, decorated with red or brown lines; aperture about three-fourths the shell's height, narrow above, widened below; the columella vertical, often with an indistinct fold above, obliquely truncated at base. Operculum small, horny, linear, transverse.

There are but few species known.

Distribution.—Indo-Pacific.

1. **Bullina scabra**, Gmelin, 1790. Plate 22, fig. 26.

Bulla scabra, Gmel., Syst. Nat., ed. xiii, 1790, 3434. *Bullina scabra*, Gmel., Thes. Conch., ii, 563, pl. 120, f. 1. *Aplustrum scabrum*, Chemn.: Watson, Chall. Rep., xv, 633. *Voluta ziczac*, Mühlf., Ges. Naturf. Freunde Berlin, viii, 1818, 5, pl. 1, f. 4. *Tornatella ziczac*, Mühlf.: Don. Bismarck., 29, pl. 2, f. 20. *Bulla lineata*, Gray, Ann. Phil. (n.s.), ix, 408. *Bullina lineata*, Gray, Thes. Conch., ii, 563, pl. 120, f. 2. *B. lineata*, Wood: Hutton, M.N.Z.M., 120. *B. undata*, H. and A. Adams, G.R.M., ii, 8, pl. 56, f. 5*a*; not *Bulla undata*, Bruguière. *Bullina lauta*, Pease, P.Z.S., 1860, 19. *Bullinula scabra*, Gmel., Index 70. *Bullina scabra*, Gmel., Man. Conch. (1), xv, 176, pl. 45, f. 18–22.

Shell ovate, obese, rimate or perforate, spirally lirate. *Sculpture* consisting of close spiral grooves, formed of confluent oblong punctures; interspaces flat above, becoming narrower and rounded at the base. *Colour* white or faint roseate, with 2 distant red spiral lines and numerous arcuate or zigzag longitudinal red lines. *Spire* very short, about one-third the height of the aperture; outlines convex. *Protoconch* of 1 smooth whorl, rather large, reversed and distorted. *Whorls* about 4, the last large and swollen, convex. *Suture* not deep. *Aperture* large, narrowly angled above, somewhat contracted and effuse at the base. *Outer lip* thin and sharp, a little straightened at the middle, arched below. *Columella* vertical, straight, with a very slight fold above, and obliquely truncated at the base. *Inner lip* with a free edge on the columella, which is recurved over the more or less open umbilical chink, spreading as a very thin glaze over the convex parietal wall.

Diameter, 6·5 mm.; height, 9 mm. (Bay of Islands specimen). Diameter, 7·7 mm.; height, 12 mm. (New South Wales specimen).

Animal unknown.

Hab.—Hauraki Gulf; Bay of Islands. Also Tasmania, Australia, Polynesia, Java, Japan, Mauritius, South Africa.

Fam. **RINGICULIDÆ**, Meek.

Animal completely retractile within the shell, with short foot, head-disc wide, prolonged backward in the middle, a sort of siphon being formed by the rolled-in margins. Radula with central tooth, laterals 2, arcuate, the cusps directed inwards.

Shell short and ventricose, with conic spire of several whorls; aperture narrow, obstructed by folds on the columellar margin; peristome thickened outside, often dentate within. Operculum wanting.

In the Recent fauna this family is represented by but one genus.

Genus 1. Ringicula, Deshayes, 1838.

Ringicula, Deshayes, A.s.V., ed. 2, viii, 323. Type: *Auricula ringens*, Lam.

The animal is peculiar in the very broad head-disc, produced in a sort of siphon in the middle behind. Jaws separate, oval, reticulated. The dentition closely resembles that of *Philine* and the *Scaphandridæ*.

Shell small, solid, nearly white, ovate-globose, the spire conical; aperture from one-half to three-fourths the shell's height, conspicuously notched and channelled at the base; outer lip thickened and often dentate or crenulate within, margined with callus outside; columellar margin heavily calloused, with 2 to 4 strong entering folds.

Distribution.—Most of the tropical and subtropical seas.

Fossil from the Cretaceous.

1. Ringicula delecta, Murdoch and Suter, 1906. Plate 22, fig. 27.

Ringicula delecta, M. & S., T.N.Z.I., xxxviii, 1905 (1906), 280, pl. 21, f. 5.

Shell small, oval-globular, imperforate, with a relatively short conoidal spire, somewhat thin. *Sculpture* consisting of fine slightly variable spirals, which somewhat strengthen on the base, and are little wider than the grooves; there are 8 to 10 on the penultimate whorl and 30 to 40 on the last, 9 to 12 in front of the aperture. These spirals are crossed by close irregular incremental striæ, which in places cut the spirals into minute gemmules, and when prominent produce a lightly costate appearance. *Colour* white, fresh specimens vitreous. *Spire* shorter than the aperture, acute, terminating in a sharp apex. *Protoconch* of about 2 whorls, the nucleus minute, slightly raised, smooth, the second turn microscopically decussate. *Whorls* 5, rounded, the last proportionately large, globular, and with convex base. *Suture* impressed. *Aperture* vertical, semilunar, angled above, sinuated and with a very short open canal, notched at the base. *Outer lip* convex, straightened at the periphery, regularly arched below, sharp. *Columella* short, vertical, with 2 strong rounded folds, the lower of which is largest, and forms with the end of the columella a prominent rounded point. *Inner lip* strongly callous on the columella, forming a well-defined callus on the parietal wall, with 1 or 2 low tubercles.

Diameter, 2·9 mm.; height, 4·4 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms.

Fossil.—There is a species known from the Pliocene, *R. uniplicata*, Hutton: Murdoch, T.N.Z.I., xxxii, 216, pl. 20, f. 6.

Fam. TORNATINIDÆ, Fischer.

Animal with the foot shorter than the shell, entire behind, head-shield short, quadrangular, produced in 2 erected processes behind, near the bases of which are the eyes. Radula-teeth wanting. Gizzard armed with 3 oval tuberculate plates.

Shell spiral, cylindrical or fusiform, external, capable of containing the soft parts; spire short or sunken and concealed, the apex more or less turned over; aperture long and narrow, wider below; columella with a fold or simple; umbilicus none or very narrow; operculum wanting.

Key to Genera.

A. Shell cylindrical, with conic or flattened spire, the apex projecting and mamillar, sinistral, tilted at an angle with the body-whorl; suture channelled; columella with 1 fold .. Tornatina.

B. Shell fusiform, the last whorl forming a projecting process above the spire, apical perforation narrow or closed; aperture as long as the shell, narrow; columella with no distinct fold .. .. Volvulella.

Genus 1. Tornatina, A. Adams, 1850.

Tornatina, A. Adams, Thes. Conch., ii, 1850, 554. Type: *T. voluta*, Q. & G.

Shell cylindrical or oblong, with conical or flattened spire, the apex projecting and mamillar, sinistral, tilted so that its axis lies at an angle of about 90° with that of the shell; suture channelled; aperture long, narrow above, dilated and rounded below, the outer lip arched forward, retreating at suture and base; columella arcuate, calloused, with one spiral fold at its junction with the whorl.

Distribution.—World-wide. These molluscs live at moderate or considerable depths, and probably subsist mainly upon *Foraminifera*. The species are numerous.

Fossil in the Cretaceous and Tertiary.

Key to Species.

A. Shell without microscopic spiral striæ.

a. Columella biplicate; 1 sharp plait above and 1 rounded fold below .. .. *biplicata.*

aa. Columella with 1 plait.

b. Spire raised above the crown, its height about one-fifth to one-sixth that of the aperture .. .. *Cookiana.*

bb. Nucleus only raised above the crown; columella with 1 broad grooved plait .. .. .. *Charlottæ.*

bbb. Spire not raised above the crown; columella with an indistinct fold .. .. *decapitata.*

B. Shell with more or less distinct microscopic spiral striæ.

a. Columella with a strong plait; surface with wavy microscopic spiral striæ .. .. *oruaensis.*

aa. Columella with a not prominent fold.

b. Spire not raised above the crown, involute.

c. Crown with angularly rounded edge, surface microscopically spirally striate .. .. .. *Murdochi.*

cc. Crown with carinated and furrowed edge, traces of spiral striæ behind outer lip .. .. *pachys.*

bb. Nucleus raised above the crown, with microscopic spiral striæ on the lower half of the body-whorl .. *tenuilirata.*

1. Tornatina biplicata, Suter, 1909. Plate 22, fig. 28.

Tornatina biplicata, Sut., P. Mal. S., viii, 1909, 255, pl. 11, f. 9.

Shell small, cylindric, mucronate, thin, smooth, with a sharp columellar plait and a broadly rounded fold below it. *Sculpture*: The perfectly smooth surface shows only indistinct growth-lines. *Colour* white. *Spire* slightly depressed, the nucleus raised above the level of the body-whorl. *Protoconch* papillary, rather small, tilted. *Whorls* 4, sharply angled above, the last subcylindrical, slightly descending; base rounded. *Suture* channelled. *Aperture* vertical, very narrow above, much widened below. *Outer lip* thin, sharp, considerably arched forward at the middle, convex above and at base. *Columella* with a very oblique narrow and sharp plait at the junction with the parietal wall, twisted below, forming a very distinct broadly rounded fold. *Inner lip* spreading narrowly and thinly over the lightly convex parietal wall.

Diameter, 2 mm.; height, 3·8 mm.

Animal unknown.

Type in my collection.

Hab.—Lyall Bay, Cook Strait (A. Hamilton).

2. Tornatina Charlottæ, Suter, 1909. Plate 22, fig. 29.

Tornatina Charlottæ, Sut., P. Mal. S., viii, 1909, 256, pl. 11, f. 10.

Shell small, oblong, thin, smooth, with projecting nucleus, and distinct columellar fold. *Sculpture* consisting of fine curved growth-lines only. *Colour* white. *Spire* depressed, almost flat, the nucleus only rising above the last whorl. *Protoconch* papillary, tilted, sinistral. *Whorls* 4, angled above, the last nearly as high as the shell, angularly rounded above, slightly narrowed at the base, sides straight. *Suture* channelled. *Aperture* high, narrow above, widened below. *Outer lip* thin and sharp, its edge arched forward at the middle, narrowly convex above, broadly and regularly rounded at the base. *Columella* vertical, slightly arcuate, with a distinct broad fold below, which has a lightly impressed median groove; at the junction with the parietal wall a blunt angle is formed. *Inner lip* thin, indistinct.

Diameter, 1·6 mm.; height, 3·1 mm.

Animal unknown.

Type in my collection.

Hab.—Queen Charlotte Sound, in 16 fathoms (Captain Bollons).

3. Tornatina Cookiana, Suter, 1909. Plate 22, fig. 30.

Tornatina Cookiana, Sut., P. Mal. S., viii, 1909, 256, pl. 11, f. 11.

Shell small, oblong, with slightly raised spire, thin, white, smooth. *Sculpture* consisting of very fine dense curved growth-lines only. *Colour* white. *Spire* raised, conoidal, one-fifth to one-sixth the height of the aperture. *Protoconch* papillary, tilted, sinistral. *Whorls* $3\frac{1}{2}$, slowly increasing and descending, sharply angled above, the last

very high, cylindrical, rounded at the base. *Suture* channelled. *Aperture* high, narrow above, considerably widened below. *Outer lip* moderately strong, sharp, narrowly rounded above, regularly convex below, the median part of the edge arched forward. *Columella* short, oblique, with a slight fold, forming no distinct angle at the junction with the lightly convex parietal wall. *Inner lip* spreading as a thin callosity over the latter.

Diameter, 1·5 mm.; height, 3·2 mm.

Animal unknown.

Type in my collection.

Hab.—Lyall Bay, Cook Strait (A. Hamilton).

4. Tornatina decapitata, Suter, 1909. Plate 22, fig. 31.

Tornatina decapitata, Sut., P. Mal. S., viii, 1909, 256, pl. 11, f. 12.

Shell small, subcylindrical, truncated at the top, very thin, vitreous, smooth. *Sculpture* formed by exceedingly fine and dense curved growth-lines. *Colour* white. *Spire* depressed, the nucleus not projecting above the body-whorl. *Protoconch* large, papillary, tilted. *Whorls* 3, angled above, the last being the height of the shell, straight at the middle, narrowed and rounded at the base. *Suture* canaliculate. *Aperture* vertical, as high as the shell, narrow above, widened below. *Outer lip* thin and sharp, narrowly rounded and somewhat ascending above, slightly advancing at the middle, regularly convex at base. *Columella* vertical, lightly arcuate, twisted into a not very distinct fold, forming a prominent angle with the parietal wall, which is convex at its lower part, almost straight above.

Diameter, 1·5 mm.; height, 2·8 mm.

Animal unknown.

Type in my collection.

Hab.—Hohoura Bay (R. Buddle).

5 Tornatina Murdochi, n.n. Plate 22, fig. 32.

Cylichna simplex, Murdoch and Suter, T.N.Z.I., xxxviii, 1905 (1906), 279, pl. 21, f. 3, 4.

Shell small, subcylindrical, involute, imperforate, thin, and glossy. The *sculpture* consists of exceedingly fine growth-striæ, with here and there faintly marked growth-periods; the axial striæ are crossed by equally fine microscopic spiral lines, in places scarcely perceptible. *Colour* white. *Spire* sunken, concave, broad, and moderately deep, the central nucleus somewhat raised. *Protoconch* papillate, tilted. *Whorls* 4, narrowly coiled up, angularly rounded above, the last representing the height of the shell, subcylindrical. *Suture* deep, narrow, channelled. *Aperture* as high as the shell, narrow above, expanded and slightly effuse below. *Outer lip* almost straight, sharp, rounded at both ends. *Columella* short, concave, with an imperceptible fold, curved towards the convex parietal wall. *Inner lip* narrowly re-

flected over the columella, spreading as a thin callus over the parietal wall.

Diameter, 2·2 mm. ; height, 4·4 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms.

Remark.—The specific name being preoccupied in *Tornatina* by A. Adams, 1850, it gives me great pleasure to unite the name of my friend Mr. R. Murdoch with the species.

6. **Tornatina oruaensis,** Webster, 1908. Plate 22, figs. 33, 33*a*.

Tornatina oruaensis, Webster, T.N.Z.I., xl, 1907 (1908), 255, pl. 20, f. 12–15.

Shell cylindrical, white, of 3½ whorls, slightly concave in the crown, above the centre of which projects the smooth protoconch, tilted at an angle of somewhat less than 90°. *Sculpture :* Faint growth-lines, prominent posteriorly, following the curve of the outer lip, the surface scored with fine wavy spiral furrows. *Suture* deep. Type I : Crown hollow, the tilted apex visible above it ; *outer lip* longer than the shell, advancing in the centre and rounded anteriorly ; *columella* arcuate, with a thin but distinct labial pad and a very strong fold. which is thickened anteriorly. Type II : *Apex* subscalar ; *aperture* shorter than the shell ; *columella* with a much slighter fold than the last. (Webster.)

Diameter, 1·25 mm. ; height, 3 mm.

Type in Mr. Webster's collection.

Hab.—Orua Bay, Manukau Harbour, in 3 fathoms.

Remarks.—These shells (about fifty), obtained by dredging, show many variations of apex between these types ; the protoconch is never sunk below the crown, as in *Cylichna*. (Webster.)

I have not seen this species.

7. **Tornatina pachys,** Watson, 1883. Plate 22, fig. 34.

Utriculus (*Tornatina*) *pachys*, Wats., J.L.S., xvii, 1883, 331 ; Chall. Rep., xv, 660, pl. 49, f. 8. *T. pachys*, Wats., Man. Conch. (1), xv, 198, pl. 24, f. 33.

Shell rather large, gibbously oval, being tumid in front and contracted upwards, truncated above, where the edge is carinated and furrowed, with an impressed top and a papillary apex. *Sculpture :* Longitudinals—the lines of growth are few, sinuous, and very slight. Spirals—round the edge of the impressed top is a rounded keel, with an exterior strongish rounded furrow, outside of which is a narrow sharpish keel ; within the apical pore the whorls are sharply keeled above the channelled suture ; the only other trace of spiral striation is behind the outer lip, where the fresh shell shows some trace of a spiral texture. *Colour* horny yellowish-white. *Aperture* club-shaped, large, the full length of the shell being a little produced posteriorly,

shortly curved across the body, ample in front. *Whorls* 4, the earlier ones only indistinctly visible in the impressed top; the nucleus is papillary. *Suture* deeply channelled, with a sharp keel above it; this keel runs out not above but on the edge of the funnel-shaped top. *Outer lip* rises from the inner side of the apical depression and slopes flatly outwards, forming thus the patulous opening of the funnel-shaped depression; at the apical keel it is angulated; from this point it makes a convex sweep, with a slight contraction about the middle; it is patulous and somewhat elliptical in front. Top nearly flat, only the outer lip rises slightly above the level; the apical depression is funnel-shaped, having a wide converging mouth and a small, not deep hole in the middle, with a papillary apex in the middle. *Inner lip:* A broadish distinct white glaze extends across the body, on which the curve of the lip is very regularly convex on to the narrow, long, low, and twisted pillar-tooth; beyond this the columella is slightly concave, narrow, a little patulous, and appressed. (Watson.)

Diameter, 3·5 mm.; height, 5·75 mm.

Animal unknown.

Type in the British Museum.

Hab.—Off East Cape, in 700 fathoms (" Challenger ").

Fossil in the Pliocene (*teste* Hutton).

8. Tornatina tenuilirata, Suter, 1909. Plate 23, fig. 1.

Tornatina tenuilirata, Sut., P. Mal. S., viii, 1909, 257, pl. 11, f. 13. *T. pachys*, Watson: Murdoch and Suter, T.N.Z.I., xxxviii, 280; not of Watson.

Shell small, cylindrical, mucronate, thin, white, with microscopic spiral striæ on the lower half. *Sculpture* consisting of distinct fine curved growth-lines, and inequidistant microscopic spiral lines on the anterior half of the body-whorl. *Colour* white. *Spire* depressed, almost flat, the nucleus only projecting above the last whorl. *Protoconch* papillary, smooth and glossy, tilted. *Whorls* 4, narrowly angled above, the last cylindric, but little narrowed below. *Suture* channelled. *Aperture* vertical, nearly as high as the shell, very narrow above, prominently widened below. *Outer lip* thin, sharp, narrowly rounded above, somewhat advancing at the middle, regularly convex at base. *Columella* slightly oblique, with a deep-seated fold, forming an inconspicuous angle with the moderately convex parietal wall. *Inner lip* spreading over the latter as a very thin glaze.

Diameter, 1·6 mm.; height, 3·2 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms.

Remark.—After careful comparison with Watson's description and figure I have come to the conclusion that this species is decidedly distinct. I wish to state that the wrong identification rests with me alone.

Genus 2. Volvulella, Newton, 1891.

Volvulella, Newton, Syst. List Edwards Coll. Brit. Olig. & Eoc. Moll., 268. Type: *V. acuminata*, Bruguière. *Volvula*, A. Adams, in Sowerby's Thes. Conch., ii, 1850, 558; not *Volvulus*, Oken, 1815, nor of Brullé, 1835.

Animal with a squarish frontal disc, produced into 2 processes behind, in front of which are the eyes. No epipodial lobes; foot shorter than the shell.

Shell external, subcylindrical or long-oval, tapering at both ends, the body-whorl more or less produced in a beak or spine above; spire concealed; aperture as long as the shell, very narrow; the outer lip simple, produced above; columella somewhat thickened, with the trace of a fold.

Distribution.—European seas, Antilles, Indian Ocean, China and Japan to Australasia.

Fossil from the Eocene.

1. **Volvulella reflexa**, Hutton, 1886. Plate 23, fig. 2.

Cylichna (*Volvula*) *reflexa*, Hutt., T.N.Z.I., xviii, 1885 (1886), 333.

Shell small, subcylindrical, with a sharply pointed vertex and narrowly rounded base, polished, spirally striate. *Sculpture* consisting of a few distant spiral lines on the base and vertex, with inconspicuous fine spiral lines at the middle, which are much closer together; growth-lines fine. *Colour* yellowish-white. Only 1 *whorl* visible, which is produced to a sharp point above, flattened at the middle, narrowed at the base. *Aperture* as long as the shell, very narrow above, widened below. *Outer lip* simple, sharp, extending above to the vertex. *Basal lip* narrowly convex, slightly effuse. *Columella* short, oblique, with an indistinct fold. *Inner lip* strongly reflected over the columella and parietal wall, a very thin glaze extending over the inner half of the ventral side of the body-whorl.

Length, 0·12 in. (= 3 mm.), (type, from the Miocene). Diameter, 1·7 mm.; height, 5 mm. (adult Recent specimen).

Animal unknown.

Type, from the Miocene of White Rock River, South Canterbury, in the Canterbury Museum, Christchurch.

Hab.—Off Cuvier Island, in 38 to 40 fathoms (Captain Bollons).

Remarks.—This species was discovered by my friend Mr. R. Murdoch, of Wanganui, in dredgings from Cuvier Island. He compared the specimens with fossil forms which were undoubtedly Hutton's species, and he is of opinion that the Recent shells cannot be separated from them. Since then I found two specimens, one of them adult, in dredgings from the same locality, kindly given to me by Captain Bollons.

Fossil in the Miocene.

Fam. SCAPHANDRIDÆ, Fischer.

Animal with a short cephalic shield, truncated posteriorly; no tentacles, the eyes deeply imbedded; epipodial lobes well developed; 3 calcareous stomachal plates, two broad and paired, one narrow and single; they are not tuberculate. Radula having the central tooth small, with a very large lateral on each side of it, and either a few smaller marginals or none.

Shell spiral, external, the spire sunken or concealed.

The form of the shell is so various that no useful diagnosis of the family can be drawn from that organ.

This family differs from *Tornatinidæ* in the obsolescence of posterior lobes on the head-shield, in the well-developed radula, and the large lateral epipodial lobes. It differs from *Bullidæ* in the highly specialised form of the radula-teeth and their small number in a transverse row.

The animals are carnivorous.

Genus 1. Cylichnella, Gabb, 1873.

Cylichnella, Gabb, Proc. Acad. Nat. Sci. for 1872 (1873), 273. Type: *Bulla bidentata*, d'Orbigny. *Bullina*, Risso, 1826; not of Férussac, 1822. *Cylindrella*, Swainson, Mal., 1840; not of Pfeiffer, 1840. *Cylichna*, Lovén, 1846; not *Cylichnus*, Burmeister, 1844. *Cryptaxis*, Jeffreys, 1883; not of Lowe, 1854, nor of Reuss, 1865. *? Mnestia*, H. and A. Adams, 1854. *Bullinella*, Newton, 1891. *Clistaxis*, Cossmann, 1895. *Cyclina*, Gray, 1857; not of Deshayes, nor *Cyclinus*, Kirby, 1837.

Animal with a long head-disc, truncated in front and behind. Mouth armed with a pair of jaws composed of imbricating prickly elements; gizzard containing 3 equal oval calcareous plates. Radula with the central tooth small, erect, with a bilobed serrate apex; laterals large, hooked, with a series of fine denticles near the edge; marginals small, simple, from 2 to 5 in number on each side.

Shell rather small and subcylindrical, the spire sunken and umbilicate or closed and concealed by the calloused inner lip; moderately solid, smooth or with spiral striæ; aperture as long as the shell, narrow above, somewhat dilated toward the base; columella rather thickened, simple or somewhat sinuous; outer lip receding toward the suture.

Distribution.—World-wide.

Fossil in the Cretaceous and Tertiary.

Key to Species.

A. Shell without spiral lines, inequidistant sharp axial striæ.. .. .. *striata.*
B. Shell with spiral sculpture.
  a. With dense microscopic undulating spiral lines .. .. *pygmæa.*
  aa. The fine close spiral lines almost effaced medially, wider spaced above .. .. *Thetidis.*

1. **Cylichnella pygmæa**, A. Adams, 1850. Plate 23, fig. 3.

Bulla (*Cylichna*) *pygmæa*, A. Ad., in Thes. Conch., ii, 595, pl. 125, f. 150. *Haminea pygmæa*, A. Ad., A.M.N.H. (3), ix, 155. *Cylichna pygmæa*, A. Ad., Man. Conch. (1), xv, 319, pl. 59, f. 9. *Bullinella pygmæa*, A. Ad.: Tate and May, P.L.S. N.S.W., 1901, 416; Pritchard and Gatliff, P.R.S. Vic. (n.s.), xv, 214. *Cylichna Atkinsoni*, T.-Woods, P.R.S. Tas., 1875 (1876), 156; Man. Conch., *t.c.*, 318. *C. pygmæa*, A. Ad.: Murdoch and Suter, T.N.Z.I., xxxviii, 279.

Shell small, subcylindrical, slightly contracted in the middle, apex umbilicated, white, shining, axially striated. *Sculpture* consisting of subequidistant flexuous distinctly marked growth-lines, crossed by dense and undulating fine microscopic spiral lines, more distinct on the base. *Colour* white. *Spire* deeply sunken, top narrowly funnel-shaped, with a relatively wide and deep perforation. The *body-whorl* angularly rounded and ascending above, almost straight at the sides, somewhat widened toward the base. *Aperture* as high as the shell, very narrow above, much dilated below, and slightly effuse at the base. *Outer lip* thin and sharp, produced above, inflexed at the middle, regularly rounded below. *Columella* very short, straight, forming an imperceptible angle with the first flattish higher-up convex parietal wall. *Inner lip* narrow, spreading over the whole height of the parietal wall.

Diameter, 2 mm.; height, 4·5 mm.

Animal unknown.

Type in the British Museum.

Hab.—Off Great Barrier Island, in 110 fathoms. Also Australia and Tasmania.

2. **Cylichnella striata**, Hutton, 1873. Plate 23, fig. 4.

Cylichna striata, Hutt., C.M.M., 52; J. de Conch., 1878, 40; M.N.Z.M., 120; Murdoch, T.N.Z.I., xxxvii, 218, pl. 7, f. 1, 2. Not *C. striata*, Hutt.: Pilsbry, Man. Conch. (1), xv, 319, pl. 59, f. 11, 12.

Shell small, subcylindrical, truncated above and rounded at the base, thin, white, axially sharply striate. *Sculpture* consisting of somewhat inequidistant numerous flexuous sharp axial striæ, much narrower and sharper than in *pygmæa*; there is no spiral sculpture. *Colour* white. *Spire* sunken, top concave, with a deep and moderately broad perforation, through which part of the earlier whorls can be seen. The *last whorl* forming the height of the shell; its first half is almost straight at the middle, the second half distinctly contracted; narrowly rounded above, broadly convex at the base. *Aperture* as high as the shell, narrow above, widened and slightly effuse below. *Outer lip* thin and sharp, advancing and slightly concave at the middle, convex above and below. *Columella* vertical, short, thickened, obliquely truncated below, slightly twisted, forming a more or less distinct angle with the parietal wall, which is convex at its lower part, straight above. *Inner lip* narrow, bounded by a fine ridge at the columella, extending as a thin glaze over the parietal wall.

Diameter, 1·3 mm.; height, 2·5 mm. (type). Diameter. 1·9 mm.; height, 3·8 mm. (Whangaroa specimen).

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Whangaroa Harbour (C. Traill); dredged in Rangitoto Channel (T. F. Cheeseman); Foveaux Strait, in 15 fathoms; Port Pegasus, Stewart Island, in 18 fathoms; near the Snares, in 50 fathoms (Captain Bollons); ten miles north of Enderby Island, Auckland Islands, in 85 fathoms (E. R. Waite).

Fossil in the Miocene and Pliocene.

3. Cylichnella Thetidis, Hedley, 1903. Plate 23, fig. 5.

Cylichna Thetidis, Hedley, Mem. A.M., iv, pt. 6, 1903, 395, fig. 111 in text; Murdoch and Suter, T.N.Z.I., xxxviii, 279. *? C. zealandica*. T. W. Kirk, T.N.Z.I., xii, 307. *C. striata*, Hutton: Pilsbry, Man. Conch. (1), xv, 319, pl. 59, f. 11, 12; not of Hutton.

Shell rather large, narrow, elongated, cylindrical, thin, and glossy. *Sculpture:* Growth-lines hardly perceptible, encircled by fine close incised lines; almost effaced medially, and wider-spaced above. *Colour* white. The *crown* concave, with a narrow axial perforation, partly roofed by a callous arch. *Aperture* as long as the shell, narrow above, expanded and effuse below; lined on the inner side by a sheet of callus ragged at the edge. *Columella* oblique, slightly twisted, thickened, with a slight angle at the junction with the convex lower part of the parietal wall. *Inner lip* narrow, with a furrow on the outside, spreading thinly over the parietal wall.

Diameter, 4·5 mm.; height, 11·5 mm. (type).

Animal unknown.

Type in the Australian Museum, Sydney.

Hab.—Off Great Barrier Island, in 110 fathoms; Auckland Harbour (G. W. Wright); near Cuvier Island, in 37 fathoms (Captain Bollons); near Channel Island, Hauraki Gulf, in 25 fathoms; Foveaux Strait, in 15 fathoms. The type is from off Manning River, Australia, 22 fathoms.

Remarks.—This species has evidently been taken for *M. arachis*, Q. & G., which does not occur in New Zealand waters. The type of *C. zealandica*, Kirk, has been lost; it was not figured, and the short diagnosis is applicable to quite a number of species. It was found at Waikanae.

Fam. **BULLARIIDÆ**, Dall.

Bullidæ, Pilsbry.

Animal capable of complete retraction into the shell, with a large head-disc, truncated in front, bilobed behind, bearing eyes about in the middle. No epipodial or parapodial lobes; foot long, tapering

behind. Stomach containing 3 dumb-bell-shaped chitinous plates. Radula having few longitudinal rows of teeth, formula 1+2+1+2+1; the central tooth transverse, bar-shaped, with reflexed multidentate cusp, a submedian denticle smaller; laterals 2 on each side, claw-shaped, with numerous denticles. A cuspless plate lies outside of the outer lateral.

Shell wholly external, globose, oval, or oblong-cylindric, with umbilicated vertex (rarely covered) and sunken spire, mottled colour-pattern, and smoothish surface; aperture as high as the shell, rising above the vertex, narrow above, dilated below; columella simply concave, with reflexed crescentic callus and no fold.

The animals are herbivorous.

Genus 1. Bullaria, Rafinesque, 1815.

Bullaria, Rafinesque, Anal. Nat., 1815, 142; new name for *Bulla*, Linné. Type: *Bulla ampulla*, L. *Bulla*, Linné, 1758, Syst. Nat., 725; not of Linné, *op. cit.*, 427, nor of Müller, 1776. *Bullus*, Montfort, 1810. *Bullea*, Blainville, 1825. *Gondole*, Latreille, 1825. *Vesica*, Swainson, 1840.

Animal capable of complete retraction into the shell. Head-shield rounded in front, produced behind in 2 rounded posterior processes separated by a median sinus; eyes small, wide apart, about half-way back on the shield. Epipodial lobes wanting. Foot large, nearly as long as the shell, roundly subtruncate behind, wide and blunt in front. Gizzard containing 3 subequal nearly similar horny or chitinous plates, which are dumb-bell-shaped on the outer surfaces, the inner or grinding surfaces being somewhat truncated, wedge-shaped, with flat tops. The side view shows a ledge (where the muscles of the stomach-wall are attached) separating the outer from the grinding face. Radula large, with dark chitinous teeth; the laterals not differentiated from the marginals; central tooth like a transverse bar, its reflexion with numerous denticles, the median one smaller; laterals claw-shaped, with about 6 long denticles; outside of the second lateral lies a small thin basal plate without cusps, the remnant of a third lateral tooth.

Shell oval or ovate, compactly involute, generally solid and with a mottled colour-pattern; spire sunken, umbilicated; aperture as high as the shell, rising slightly above the vertex, its upper portion narrow, expanded toward the base; lip simple, flexuous; columella short and concave, with a crescentic white reflexed callus; parietal wall smooth, with a light callus.

The species inhabit sandy mud-flats, the slimy banks of river-mouths, and brackish places near the sea; at low water some of them conceal themselves in the mud and under seaweed, exuding large quantities of mucus to maintain the moisture of their skin.

Distribution.—Warm and temperate seas.

Fossil in the Cretaceous, Eocene, Oligocene, and Pleistocene.

KEY TO SPECIES.

A. Shell with microscopic spiral striæ on the upper part of the body-whorl; solid, polished, flattened at the middle; pale, marbled with reddish-brown, 2–4 bands of darker mottling .. .. *Adamsi.*
B. Shell with distant linear grooves at the base.
a. The whole surface microscopically spirally striate; yellowish or grey, marbled with light brown, 1 or 2 darker bands .. *australis*
aa. Microscopic spiral liræ obsolete; usually uniformly reddish-brown .. .. *Quoyi.*

1. **Bullaria Adamsi,** Menke, 1850. Plate 49, fig. 6.

Bulla Adamsi, Menke, Zeitschr. f. Malac., 1850, 162; Brazier, P.L.S. N.S.W., x, 1885, 92; Man. Conch. (1), xv, 345, pl. 35, f. 15, 16, 19, 20; Suter, T.N.Z.l., xxxix, 265. *B. australis*, A. Adams, Thes. Conch., ii, 576, pl. 122, f. 64–66; Sowerby, Conch. Icon., f. 12; Watson, Chall. Rep., xv, 638 (in part); not *B. australis* of Gray, Sowerby, nor Quoy and Gaimard.

Shell oval-cylindric, solid, polished, almost smooth, marbled and banded with reddish-brown. *Sculpture* consisting of distinctly marked dense growth-lines, crossed by fine microscopic spiral striæ on the upper part of the whorl. *Colour* pale, closely marbled with reddish-brown, generally having 2 to 4 bands of darker mottling; aperture and inner lip white. *Spire* sunken, vertex with a narrow deep perspective umbilicus, the earlier whorls spirally striated. The *body-whorl* convex, flattened at the middle toward the aperture, angularly narrowly rounded above; base broadly convex. *Aperture* narrow above, much wider below. *Outer lip* solid, with a rather blunt edge, narrowly rounded, rising slightly above the vertex, nearly straight in the middle. *Basal lip* broadly convex. *Columella* subvertical, short, concave. *Inner lip* thick, spreading a short distance beyond the pillar, and extending over the convex parietal wall.

Diameter, 30 mm.; height, 45 mm. Diameter, 16 mm.; height, 26 mm. (New Zealand specimen).

Animal unknown.

Hab.—Cape Maria van Diemen; Bay of Islands (J. C. Anderson). Also Tahiti; Tonga; islands in Torres Straits and off north-east Australia.

2. **Bullaria australis,** Quoy and Gaimard, 1833. Plate 49, fig 7.

Bulla australis, Q. & G., Voy. Astrol., ii, 1833, 357, pl. 26, f. 38, 39; Gray, Annals of Philos. (n.s.), ix, 1825, 408; Dieff. N.Z., 243; Chall. Rep., xv, 638; Man. Conch. (1), xv, 346, pl. 35, f. 12–14, 17, 18. *B. oblonga*, A. Adams, Thes. Conch., ii, 1854, 577, pl. 123, f. 74; Conch. Icon., pl. 3, f. 9; C.M.M., 52; M.N.Z.M., 121. For full list of references, see Pritchard and Gatliff, P.R.S. Vic., xv (n.s.), 214.

Shell oval-cylindric, rather thin, shining, apparently smooth, with a few spiral grooves at the base, yellowish-brown, marbled with darker, sometimes transversely banded. *Sculpture:* There are distinct flexu-

ous oblique growth-lines, with occasional periods of rest; the whole shell microscopically finely and densely spirally striated, the striæ distinctly wavy; on the base there are a number of distant linear spiral grooves. *Colour* usually light yellow or grey, marbled with light brown, sometimes with 1 or 2 darker spiral bands; aperture light olive inside; inner lip white. *Spire* sunken, vertex with a narrow deep not perspective umbilicus, with spiral striation. *Body-whorl* elongate-oval, narrowed above, convex, but somewhat flattened on the last half-turn; base rounded. *Aperture* high, extending beyond the spire, narrow above, enlarged toward the base. *Outer lip* thin and sharp, sometimes slightly strengthened inside by a narrow white callus, narrowly rounded above, flatly convex in the middle. *Basal lip* regularly arched. *Columella* subvertical, short, concave. *Inner lip* reflexed over the pillar, spreading over the convex parietal wall.

Diameter, 26 mm.; height, 50 mm. (type). Diameter, 22 mm.; height, 36 mm. (large Auckland specimen).

Animal similar to that of the subspecies.

Type in the Mus. Hist. Nat., Paris.

Hab.—Coasts of the North Island, on sandy mud, from low water to 5 fathoms. Also Australia and Tasmania. The type is from King George's Sound, Western Australia.

Remarks.—New Zealand specimens perfectly agree with those from Port Jackson, but they are mostly much smaller. They are not so much narrowed above as the type. Gray's descriptions are quite inadequate, and not accompanied by a figure.

Fossil in the Pleistocene of Australia.

Subsp. Quoyi, Gray, 1843.

Bulla Quoyi, Gray, Dieff. N.Z., 243; Ereb. & Ter., 5, pl. 1, f. 11; M.N.Z.M., 121. *B. striata*, Lam., Voy. Astrol., ii, 354, pl. 26, f. 8, 9, not of Lamarck; not *B. Quoyi* of A. Adams, Sowerby, nor Carpenter. *B. Quoyi*, Gray, Man. Conch. (1), xv, 348, pl. 39, f. 71. *Bulla* (*Haminea*) *castanea*, A. Ad., Thes. Conch., ii, 584, pl. 124, f. 106*a*.

Shell rather large, solid, oval-cylindric, smooth, with spiral grooves at the base and in the apical umbilicus; colour mostly reddish-brown. *Sculpture* consisting of well-marked oblique growth-lines; there are a number of distant linear spiral grooves at the base; the microscopic fine spiral striæ of the species are absent or inconspicuous. *Colour* indistinctly and closely marbled with fleshy purple-grey on a pale ground, with 2 or 3 ill-defined encircling zones of heavier darker mottling, but usually the shell is uniformly reddish-brown, with indications of 2 or 3 darker spiral bands; aperture greyish-white inside, inner lip white. In all other characters the subspecies agrees with the species.

Diameter, 16 mm.; height, 25 mm. (type). Diameter, 27 mm.; height, 44 mm. (Auckland specimen).

Animal having an elongated head-shield, arched and auriculate in front, deeply divided behind, the two processes produced over the shell; it is brownish above, yellow below. Eyes black and very distinct, in the middle of a small disc. Foot rounded, somewhat cordiform, with brown striæ, and margined with black in front. (Q. & G.)

Type in the British Museum.

Hab.—Bay of Islands (Q. & G.); Auckland Harbour (H. S.).

Remarks.—This subspecies differs from *B. australis* in the colour, which is always much more reddish, and adult specimens from Auckland Harbour are not marbled; it is considerably more solid, and the fine spiral striation is obsolete or absent. In my opinion, it cannot take the rank of a distinct species. The type was collected by Dr. Stanger.

Fam. ACERIDÆ, Pilsbry, em.

Bullidæ, Fischer (in part).

Radula having many longitudinal rows of teeth, the central tooth narrow, hardly larger than the laterals, with the cusp serrate; laterals falcate, with the cusp long and serrate, becoming simple on the outer teeth.

Shell oval or cylindrical, thin and fragile, of a light yellow-brown or green tint, the spire low or concealed.

Subfam. ACERINÆ.

Animal with long narrow head-disc, large epipodial lobes reflexed over the shell, and many cartilaginous stomach-plates.

Shell fragile, elastic, with entirely exposed nearly level spire, deep sutural slit, and wide anal fasciole.

Genus 1. ACERA, O. F. Müller, em. 1776.

Akera, Müll., Zool. Danicæ, Prodr., 242. Type: *A. bullata*, Müll. *Aceras*, Locard. *Eucampe*, Leach, 1847.

Animal not completely retractile; head-disc depressed, long and narrow, truncated in front, tapering behind; eyes lateral, distinct. Mantle rudimentary, enclosed in the shell, having a posterior fleshy lobe passing backward and ascending the spire in the anal fasciole. Foot long and narrow; parapodial lobes very large, reflexed over the shell. Stomach containing about a dozen subtriangular, pointed, large and small cartilaginous plates. Jaw separate, oval, reticulated. Radula having the central tooth subtriangular, with bilobed base and reflexed serrate cusp. Inner laterals falcate, with long serrate cusps; outwardly the cusps become longer and gradually lose the serration, the outer teeth being acicular.

Shell ovate or oval-cylindric, thin, fragile, elastic, with exposed nearly level spire of several whorls; last whorl acutely keeled at the shoulder, the keel bounding a flat anal fasciole; aperture nearly as

long as the shell, narrow above and extending in a deep sinus along the suture, dilated below and very effuse, permitting all the whorls to be seen from the base through the spirally ascending columella; columella very concave, thin, with narrowly reflexed edge.

Distribution.—Most seas.

Fossil in the Tertiary.

The young animals use the parapodial lobes as swimming-organs.

1. Acera tumida, A. Adams, 1850. Plate 23, fig. 6.

Bulla (*Akera*) *tumida*, A. Ad., Thes. Conch., ii, 573, pl. 125, f. 169. *Akera tumida*, A. Ad., Conch. Icon., xvi, f. 2; C.M.M., 53; Crit. List, 38; J. de Conch., 1878, 41; M.N.Z.M., 122; Man. Conch. (1), xv, 379, pl. 42, f. 14.

Shell horny, fragile, ovately cylindrical, spire rather flattened, semipellucid, tumid in the middle, and rather gibbous near the inner lip, encircled with a faint scarcely conspicuous fuscous band, spirally very finely striated, longitudinally somewhat plicated; aperture anteriorly very much dilated. (Ad.)

Diameter, 10·5 mm.; height, 16 mm. (figure).

Type in the British Museum (?).

Hab.—New Zealand (Adams).

The locality requires confirmation. I have not seen this species.

Subfam. HAMINEINÆ.

Animal with a quadrate head-disc, bilobed behind; epipodial lobes large, reflexed over the shell. Principal stomach-plates 3 (Plate 1, fig. 6).

Shell brittle, with concealed spire; a posterior sinus, but no sutural slit or anal fasciole; the interior not wholly visible from base.

Genus 1. HAMINEA, Gray, 1847.

Haminea, Gray, P.Z.S., 1847. Type: *Bulla hydatis*, L.

Animal capable of retraction into the shell; cephalic disc large, truncated in front, strongly bilobed behind, the eyes small. Mantle rudimentary, covered by the shell. Epipodial lobes large, reflexed over and partially covering the shell. Sole long, tapering behind. Gizzard very muscular, armed within with 3 large corneous curved plates, and 3 pairs of small plates. Radula having the formula $\infty + 1 + 1 + 1 + \infty$. Central tooth small, adjacent laterals large, with a long serrate cusp; uncini many, with long simple cusps.

Shell thin and rather fragile, unicoloured, corneous, yellowish or greenish, covered with a thin cuticle, globose, ovate, or cylindric-oval, the spire sunken and concealed, vertex concave, imperforate or minutely perforate; body-whorl large; aperture as long as the shell, broadly rounded below, narrow above; columella simply concave,

thin, its edge narrowly reflexed, showing a slight fold where it joins the body of the shell; lip retreating above, but not distinctly sinused.

Distribution.—Most seas. Feeding on *Algæ* and *Zostera*.

Fossil in the Miocene and Pliocene.

Key to Species.

a. Shell subglobular oval	.. ..	*zelandiæ.*
aa. Shell elongate-cylindrical	.. ..	*cuticulifera.*

1. Haminea cuticulifera, E. A. Smith, 1872. Plate 46, fig. 30.

Haminea cuticulifera, E. A. Smith, A.M.N.H. (4), ix, 1872, 350; Smith, Zool. Col. H.M.S. "Alert," 1884, 87, pl. 6, f. H; Angas, P.Z.S., 1877, 189; M.N.Z.M., 122; Man. Conch. (1), xv, 372, pl. 41, f. 13. *Cylichna cuticulifera*, E. A. Smith: Watson, Chall. Rep., xv, 663.

Shell elongate-cylindrical, above and below roundly quadrate, thin, white, light horny and semitransparent when fresh, spirally finely and distantly grooved. *Sculpture* consisting of fine flexuous growth-lines, and rather distant fine spiral linear grooves, closer together and more distinct on the base. *Colour* white, buff-tinged toward base and vertex; uniformly light horny when fresh. *Epidermis* very thin, shining. *Vertex* impressed, imperforate, the lip reflexed at the centre. *Body-whorl* cylindrical, narrowly angularly rounded above, straight in the middle, the base flatly convex. *Aperture* as high as the shell, narrow above, scarcely produced above the vertex, widened below. *Outer lip* thin and sharp, thickened at its insertion in the middle of the vertex, produced and angularly rounded above, almost straight at the middle. *Basal lip* faintly convex. *Columella* short, rather straight, with the *inner lip* reflexed over it and forming a thin glaze on the convex parietal wall.

Diameter, 6·5 mm.; height, 14 mm. (type). Diameter, 6 mm.; height, 13·5 mm. (my New Zealand specimen).

Animal unknown.

Type in the British Museum.

Hab.—New Zealand. Also Port Jackson and Botany Bay, in 2 to 15 fathoms; Levuka, Fiji, in 12 fathoms.

2. Haminea zelandiæ, Gray, 1843. Plate 49, fig. 8.

Bulla zelandiæ, Gray, Dieff. N.Z., 243. *Haminea zelandiæ*, Gray, Ereb. & Ter., 5, pl. 1, f. 10: M.N.Z.M., 121: Man. Conch. (1), xv, 373, pl. 41, f. 11, 12; pl. 40, f. 86. *H. obesa*, Sowerby, Conch. Icon., xvi, 1868, f. 13; M.N.Z.M., 121. *Bulla* (*Haminea*) *pemphis*, Philippi: Adams, Thes. Conch., 580, pl. 124, f. 91; Sowerby, Conch. Icon., xvi. f. 12; not of Philippi.

Shell subglobular-oval, thin and fragile, with a light-brown epidermis, the vertex imperforate. *Sculpture* consisting of distinct close oblique and sinuous growth-lines, crossed by very fine and dense microscopic spiral striæ, always distinct on the last half-turn of the

whorl. *Colour* pale yellowish-brown, pure-white when the epidermis has been lost. *Epidermis* very thin, glossy, easily rubbed off. *Vertex* very slightly and narrowly impressed, imperforate, the slightly thickened lip reflexed at the middle. *Body-whorl* flattened above, convex at periphery and base. *Aperture* as high as the shell, wide below, narrowed above. *Outer lip* regularly convex, produced above. *Basal lip* broadly rounded, very thin and sharp. *Columella* deeply concave, with a slight fold at the junction with the convex parietal wall. *Inner lip* reflexed over the pillar and the parietal wall, thin, white, polished.

Diameter, 19 mm.; height, 22 mm. (type). Diameter, 19 mm.; height, 24 mm. (specimen from Pelorus Sound). Diameter, 13 mm.; height, 16 mm. (specimen from Auckland).

Animal undescribed.

Type in the British Museum.

Hab.—Bay of Islands; Hauraki Gulf; Pelorus Sound; Nelson. On *Zostera* beds, not uncommon.

Fam. PHILINIDÆ, Fischer.

Animal with the body oblong, the head-shield having no tentacular processes, provided with sessile eyes or without them; foot truncated or rounded behind; parapodial lobes very large and conspicuous, more or less folded over the back. Radula lacking central teeth; laterals large, marginals few or none. Formula varying from 6+1+0+1+6 to 1+0+1.

Shell capable of containing but a small part of the body, entirely internal, covered by the reflexed and united mantle; whitish, fragile, consisting of 1 or 2 whorls; spire sunken or absent; aperture extremely large, the outer lip often produced in a lobe or point above.

Genus 1. PHILINE, Ascanius, 1772.

Philine, Ascanius, Vetensk. Ak. Handl. Stockh., 1772, 329. Type: *P. aperta*, L. *Lobaria*, Müller, 1776. *Bullæa*, Lamarck, 1801. *Utriculopsis*, Sars., 1870. *Ossiana*, Monterosato, 1884. *Hermania*, Monts., 1884. + *Laona*, A. Adams, 1865, + *Johania*, Monts., 1884, + *Megistostoma*, Gabb, 1864.

Animal much too large to be included in the shell. Head-disc oblong, large, without eyes; parapodial lobes fleshy and erect; foot obliquely truncated behind, the shell and mantle projecting beyond it. Mantle reflexed and completely united over the shell. Gizzard containing 3 lozenge-shaped plates, with the inner face convex, outer face concave and sometimes pierced by 2 foramina. Sometimes gizzard-plates are rudimentary or absent. Radula without central teeth, the laterals large, erect, claw-shaped; marginals 0 to 6, small, narrow, and curved acicular when present.

Shell ovate or squarish, thin and fragile, smooth, spirally striate or punctate, or latticed, translucent, pale-coloured, consisting of few

loosely coiled whorls, which are entirely open from below; spire sunken; aperture very large, broadly effuse below; the outer lip retracted, joining a wide sinus above; columella thin, arcuate.

The egg-capsules are gelatinous, hydrophanous, ovate, containing very numerous eggs arranged in single file, on a very long funiculus, folded in a loose spiral. The embryo has a spiral shell, an operculum, and is capable of swimming by means of a ciliated veil.

The animals composing this genus are blind, like most creatures that seek their food by burrowing. They frequent mud-flats, which they perforate near the surface, and probe with their flattened heads for the small bivalves which constitute their prey; these they seize and swallow entire, breaking their shells by means of their testaceous, muscular gizzards.

Distribution.—All seas, from low-water mark to a depth of about 1,000 fathoms.

Fossil in the Cretaceous and Tertiary.

Key to Species.

A. Shell imperforate, with distinct close spiral grooves .. .. *constricta.*
B. Shell umbilicate, with inconspicuous distant spiral striæ .. *umbilicata.*

1. Philine constricta, Murdoch and Suter, 1906. Plate 23, fig. 7.

Philine constricta, M. & S., T.N.Z.I., xxxviii, 1905 (1906), 278, pl. 21, f. 1.

Shell small, thin, convolute, imperforate, spirally grooved, auriform, slightly contracted above. *Sculpture* consisting of shallow fine linear spiral grooves, leaving broader bands between them, crossed by irregularly arranged incremental lines. *Colour* white. *Spire* concave. *Protoconch* minute, smooth. *Whorls* 1½, very rapidly increasing, the last very large, contracted below the vertex. *Aperture* elongately oval, acuminate above. *Outer lip* sharp, lowly convex, microscopically transversely striated inside. *Lower lip* regularly rounded. *Inner lip* forming a broadly spread callosity upon the body, narrow on the concave oblique and twisted columella.

Diameter, 3 mm.; height, 5 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms.

Subsp. auriformis, Suter, 1909. Plate 23, figs. 8, *a–d.*

Philine constricta auriformis, Sut., P. Mal. S., viii, 1909, 257, pl. 11, f. 14–17.
P. Angasi, Crosse: Hutton, J. de Conch., 1878, 41; C.M.M., 53; M.N.Z.M., 123; not of Crosse. *P. aperta*, L., Index, 69; not of Linné.

Shell auriform, subquadrangular, thin and fragile, finely spirally striated, white. *Sculpture* the same as in the species. *Colour* white, iridescent in some parts. *Epidermis* very thin, transparent, shining. *Spire* sunken, the outer lip narrowly reflexed over the centre. *Body-*

whorl very large, flatly convex, open from below. *Outer lip* narrowly convex and projecting beyond the spire above, forming a deep sinus with the body, very little convex in the middle, rounded on joining the basal lip, which is oblique, straight, or slightly convex, regularly arched toward the high, oblique, arcuate, and very thin columella. *Inner lip* very thin, spreading broadly beyond the pillar and upon the short strongly convex parietal wall.

Diameter—Maj., 7 mm. ; min., 3·5 mm. : height, 8·8 mm. (type). Diameter—Maj., 12 mm. ; min., 6 mm. : height, 13·5 mm. (large specimen).

Animal elongate, flattened, yellowish-white, the head-disc oblong, with a distinct median longitudinal groove ; much longer than the posterior quadrangular mantle-shield, which entirely covers the shell. Parapodial lobes long, but not very high. The 3 masticatory plates are lozenge-shaped, devoid of perforations, dark brown ; outer face hollowed, with a central longitudinal flat bar, leaving a triangular groove on each side of the middle ; inner face convex, the central part with a broad longitudinal median groove. The outer layer of these plates consists of calcium-carbonate, the inner and greater part is chitinous, insoluble in acid and alkali. The length of the animal figured is 20 mm. ; that of the gizzard plates 5 mm.

Radula having the formula 1+0+1. There are about twenty longitudinal rows of teeth, which are falciform, light brown, finely serrate at the inner lower edge, the denticles simple.

Type in my collection.

Hab.—Akaroa Harbour, in 4–6 fathoms, type (H. S.) ; Wet Jacket Arm, near Resolution Island, in 12 fathoms (Captain Bollons) ; dredged on sandy flats, Rangitoto Channel (T. F. Cheeseman).

Remarks.—The sculpture is exactly like that of the species, but the form of the shell is different, not contracted above. It seems to me very probable that if series of these molluscs, obtained at different localities and from various depths, could be examined, intermediate forms would be forthcoming ; however, with the scanty material at my disposal, I consider it preferable to keep the two forms separate for the present. The sculpture alone suffices to distinguish the shell from *P. Angasi*, Crosse, and *P. aperta*, L. No doubt *Philene teres*, Hedley, recommended by Webster to be added to fauna list (T.N.Z.I., xxxvii, 280), is not Hedley's species at all, but this subspecies.

2. **Philine umbilicata,** Murdoch and Suter, 1906. Plate 23, fig. 9.

Philine umbilicata, M. & S., T.N.Z.I., xxxviii, 1905 (1906), 279, pl. 21, f. 2.

Shell small, oval, truncate above, umbilicated. *Sculpture* inconspicuous ; distant very fine microscopical spiral lines are crossed by irregular curved and very fine growth-lines. *Colour* white. *Spire* slightly immersed. *Protoconch* minute, smooth. *Whorls* 2, very

rapidly increasing, the last truncated above, rounded at the base, narrowed and flatly convex above. *Aperture* elongated oval, slightly excavated above by the parietal wall, broad and open toward the base. *Outer lip* thin, sharp, almost straight for the upper two-thirds, then forming a regular arch with the convex basal lip. *Inner lip* forming a rather broad but very thin callosity upon the parietal wall, inconspicuous on the columella, which descends with a rather sharp margin, but slightly excavated, to the basal lip. *Umbilicus* patulous, distinct.

Diameter, 2·3 mm.; height, 3·5 mm.

Animal unknown.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms.

Remark.—The species is distinguished by the almost total absence of spiral sculpture and the presence of a distinct umbilicus, which is an exception in this genus.

Fam. AGLAJIDÆ, Pilsbry.

Doridiidæ, Fischer and of authors.

Animal bearing 2 dorsal shields, with a furrow between them. The anterior shield has free margins, but as a rule is not developed into tentacles; the posterior has the margins less developed, but is produced behind into two processes. The foot is broad, truncate before and behind, and continued on each side into a fairly ample parapodium, from which it is not clearly divided. The parapodia are divided behind, and the posterior part of the body hangs over or rests on them. Organs analogous to rhinophores are often present in the form of lamellæ under the sides of the head-shield or lumps with bristles around the mouth. The branchia is a large bipinnate plume, posterior and on the right side. Behind it is the vent, in front of it the genital orifice, which is connected by an open groove with the verge on the right anterior extremity of the body. The verge is grooved, the prostate double or single.

The shell is wholly internal, posterior, and generally composed of a minute spire with a single solute whorl; sometimes wholly membranous, sometimes partly calcified, rarely wholly calcified. There are no jaws, radula, or stomach-plates, but there is, as a rule, a large, sometimes colossal, buccal bulb with thick muscular walls. (Eliot.)

Genus 1. Aglaja, Renier, 1807.

Aglaja, Renier, Tav. di Classificazione, 1807, 8. Type: *A. tricolorata*, Renier. *Doridium*, Meckel, 1809. *Acera*, Cuvier, 1810. *Eidothea*, Risso, 1826. *Melanochlamys*, Cheeseman, 1881. *Posterobranchæa*, d'Orbigny, 1837? *Bullidium*, Leue, 1813. *Lobaria*, Blainville, 1825. *? Philinopsis*, Pease, 1860.

Characters.—Those of the family, but the head-shield without rhinophores or frontal processes.

Distribution.—Mediterranean, east coast of Africa, Australasia, Japan, Sandwich Islands, west coast of the Americas, West Indies.

The genus is not known fossil.

1. **Aglaja cylindrica,** Cheesman, 1881. Plate 23, figs. 10, *a*, *b*; Plate 37, fig. 1.

Melanochlamys cylindrica, Chsm., T.N.Z.I., xiii, 1880 (1881), 224. *Aglaja cylindrica*, Chsm., Man. Conch. (1), xvi, 49.

Body elongated, almost cylindrical, 1–1¼ in. long; colour a deep rich velvety black. *Cephalic disc* narrow, oblong-quadrate, slightly expanded in front, so as to project over the foot and mouth, truncate behind. *Mantle* small, entirely concealing the shell, at its posterior end two-lobed and with a large gaping orifice. Foot large, with ample side lobes, which are folded up to the sides of the head-disc and mantle, leaving, however, the back exposed. *Branchiæ* minute, situated far back on the right side under the mantle. *Gizzard* very large and muscular, without calcareous plates. *Odontophore* apparently wanting. (Cheeseman.)

Shell calcareous, white; spire small, solute, with a small spoon-shaped projection; lower lip membranous.

Type (?).

Hab.—In tide-pools near the Tamaki Heads, Auckland Harbour, type (Cheeseman); Dunedin Harbour (G. M. Thomson).

Tribe 2. APLYSIOMORPHA.

In these Tectibranchs the shell is always much reduced and more or less internal, or it may be altogether lost in the adult. The head bears 2 pairs of tentacles. The margins of the foot, or parapodia, are separate from the ventral surface, and are generally transformed into natatory lobes. The genital duct with 1 pore; the hermaphrodite duct is connected with the verge by a ciliated groove. The animals comprised in this tribe are crawling or swimming forms.

Fam. **APLYSIIDÆ**, d'Orbigny.

Animal lengthened, not protected by a shell, the neck and head narrower than body, mouth a vertical fissure; anterior angles of head produced in 2 tentacular lobes folded above; behind them the cylindric or conical rhinophores slit above, in front of which are the minute eyes. Epipodia or pleuropodia recurved over the back, forming 2 lateral or dorsal lobes enclosing mantle and gill. Genital orifice within the dorsal slit, communicating by a long furrow with the invertible verge, which is near the anterior right tentacle. Mouth with corneous jaws and a large multiserial radula composed of similar teeth; stomach armed with cartilaginous nodules; anus behind the gill.

Shell nearly or entirely covered by the mantle, uncoiled, in the form of a concave plate, sometimes absent.

Rather large animals of flabby consistency, remarkable for the 4 large ear-like tentacles and high back, which have earned for them the name of *sea-hares*.

They are nearly world-wide in distribution in tropical and temperate seas, and almost without exception inhabit shallow water. Marine plants form their main food. Their colours in life are often bright and variegated, but in alcohol the green and violet tints are evanescent, fading usually to a dirty light-olive; but the black pigment remains unchanged, so that markings of black or grey are permanent in specimens preserved in the ordinary manner. Being without shelly armour, they are largely dependent upon imitative colouring for protection; this being supplemented by the ability to expel a large amount of violet or purple fluid, darkening the water around them, and also a milky fluid of nauseous odour; this is secreted by the "opaline gland" or "gland of Bohadsch."

KEY TO GENERA.

A. Anterior end of pleuropodial (dorsal) lobes well separated. Shell present, not calcareous .. .. TETHYS.
B. Anterior end of pleuropodial lobes contiguous, the lobes not freely mobile. Shell a minute vestige or absent .. .. NOTARCHUS.

Genus 1. TETHYS. Linné, 1758.

Tethys, Linné, Syst. Nat., ed. x, 653. Type: *T. leporina*, L. *Tethys*, Linné, 1758; not Linné, 1767, nor *Tethys, Thetis, Thethys*, &c., of subsequent authors, to the present day. *Aplysia*, Linné, 1767, and of most subsequent and all modern authors. *Laplysia*, Linné, 1767. *Siphonotus*, A. Adams and Reeve, 1848. *Syphonopyge*, Keferstein, 1866. *Neaplysia*, Cooper, 1863. *Esmia*, Leach, 1852. *Lernea*, Bohadsch, 1761 (not binomial). *Dolabella*, Risso, 1826, and in part of Lamarck, 1822.

Animal swollen behind, narrower in front, with rather long neck and head, bearing folded tentacles and slit rhinophores, as usual in the family, the latter about midway between tentacles and dorsal slit. Pleuropodia arising in front of the middle of animal's length, ample, freely mobile, free throughout their length or united for a distance behind, functional as swimming-lobes; anterior ends separated. Mantle nearly covering the gill, having a median tube, foramen or orifice communicating with shell-cavity, and produced behind in a more or less developed lobe or lobes, folded to form an excurrent siphon. Genital orifice under front edge of mantle, in front of gill; opaline gland present, a short distance behind genital opening. Foot well developed. Radula with a large multicuspidate central tooth; lateral teeth with long cusps, serrate on both sides.

Shell very thin, membranous, with a thin calcareous inner layer, nearly as large as the mantle, concave, with pointed small apex, bearing a recurved lamina, and having a concave posterior sinus.

Distribution.—All tropical and warm temperate seas.

The animal not only crawls, but swims actively by means of the "swimming-lobes."

Key to Species.

A. Shell ear-shaped, with irregular radial plications and fine lines; right side lightly convex, left upper margin broad and excavated *brunnea.*

B. Shell elongated, with concentric growth-lines only; right side auriculated, left upper margin obliquely descending, lightly concave .. .. *Tryoni.*

C. Shell subquadrangular; embryonic shell concentrically coarsely striated, the remainder smooth, polished; right side somewhat auriculated, left upper margin convex .. .. .. *venosa.*

1. Tethys brunnea, Hutton, 1875. Plate 23, fig. 11.

Aplysia brunnea, Hutt., T.N.Z.I., vii, 1874 (1875), 279, pl. 21; J. de Conch., 1878, 41; M.N.Z.M., 123. *Tethys brunnea*, Hutt., Man. Conch. (1), xvi, 97, pl. 59, f. 44; Index, 68. *Aplysia Hamiltoni*, T. W. Kirk, T.N.Z.I., xiv, 1881 (1882), 283. *Tethys Hamiltoni*, Kirk, Man. Conch. (1), xvi, 99; Index, 69.

Shell horny, ear-shaped, moderately convex, membranous, with a thin inner calcareous layer. *Sculpture* consisting of numerous well-marked concentric growth-lines, crossed by irregularly spaced radiate plications and fine lines. *Epidermis* extending beyond the calcareous layer, thin, straw-colour or pale brown, polished; inside white, with a pearly lustre. *Apex* much recurved, tubercular. Right side of shell lightly convex, base broadly rounded, left side but little rounded, upper margin broad and excavated.

Diameter, 18 mm.; height, 23 mm. (type). Diameter, 32 mm.; height, 43 mm. (type of *T. Hamiltoni*).

Animal umber-brown, with fine irregular dark markings; lighter below. Length about 100 mm. (type); or 180 mm. long and 65 mm. broad (type of *T. Hamiltoni*).

Type in the Dominion Museum, Wellington.

Hab.—Wellington (type); Dunedin; Petane, near Napier (A. Hamilton), type of *T. Hamiltoni*.

Remarks.—The type is broken, but sufficient is left to show that the outlines of Hutton's drawings are correct. The type of *T. Hamiltoni* is inseparable from *T. brunnea*, but it is larger, and seems to represent the adult form. As pointed out by Captain Hutton, the shell resembles *T. excavata*, Sowerby, and still more *T. hyalina*, Sowerby, both from Port Jackson. Of these two species the shell only is known. The shell and animal seem to me to be distinct from *T. norfolkensis*, Sowerby.

2. Tethys Tryoni, Meinertzhagen, 1880. Plate 23, fig. 12; Plate 36, fig. 6.

Aplysia Tryoni, Mein., T.N.Z.I., xii, 1879 (1880), 270. *Tethys Tryoni*, Mein., Man. Conch. (1), xvi, 98; Index, 69.

Shell horny, flexible, convex, elongated. There is no other *sculpture* except fine concentric growth-lines. The whole shell consisting

of conchin, no calcareous layer being noticeable. *Colour* light brown, darker at the centre, somewhat shining. *Apex* elevated, recurved, forming a roundish tubercle. Right side auriculated, descending in a slightly convex line, base regularly rounded, left margin shorter than the right, the upper margin obliquely descending and lightly excavated.

Diameter, 17 mm. ; height, 28·5 mm. (type).

Animal a dark brown (kelp-colour), spotted all over with grey-pepper-coloured spots. The edges of the lower lobe of the mantle marked evenly with alternate darker brown and grey. The lobe covering the shell striped with grey, all of which stripes point to, and narrow towards, the apex of the shell. Posterior sides of tentacles also a peppery-grey colour. Length, about 127 mm. (Mein.)

Type lost.

Hab.—Waimarama, Hawke's Bay, type (Meinertzhagen) ; Mangonui ; Bay of Islands ; Brighton, Otago.

Remark.—As pointed out by Mr. Hedley (P.L.S. N.S.W., 1905, 537), the shell does not differ from *T. norfolkensis*, Sowerby, from Port Jackson, and the colouring of the animal also seems to be very similar in the two species. The animals, however, will have to be carefully compared before we can be quite certain about the identity of the two species.

3. Tethys venosa, Hutton, 1875. Plate 23, fig. 13.

Aplysia venosa, Hutt., T.N.Z.I., vii, 1874 (1875), 279, pl. 21 ; J. de Conch., 1878, 41 ; M.N.Z.M., 123. *Tethys venosa*, Hutt., Man. Conch. (1), xvi, 98, pl. 59, f. 39 ; Index, 68.

Shell membranous, the epidermis pale straw-colour. *Apex* rather coarsely concentrically striated, the rest of the shell smooth and polished.

Diameter, 25·5 mm. ; height, 31·5 mm.

Animal yellowish-brown, veined with dark brown, about 6 in. (= 152 mm.) long.

Type in the Otago University Museum, Dunedin.

Hab.—Wellington ; Sumner, near Christchurch.

Genus 2. Notarchus, Cuvier, 1817.

Notarchus, Cuvier, " Règne Animal," ii, 398. Type : *N. indicus*, Schweigger. *Bursatella*, Blainville, in Férussac, 1822. *Aclesia*, Rang, 1828. *Stylocheilus*, Gould, 1852.

General form long-ovate or fusiform, plump in the middle. Tentacles, rhinophores, eyes, and genital groove as usual in the family. Pleuropodial lobes broadly united behind over a large gill-cavity, their anterior ends contiguous, free margins short, contiguous ; the dorsal slit subcentral and short. Mantle membranous, small, not

covering the long arcuate gill. Genital pore near anterior end of dorsal slit. Foot narrower than the body, long, acute behind. Radula wide, with well-developed triangular central tooth with serrate cusp; the laterals narrower, with the cusp long and serrate on both edges; marginals with the basal plates shorter, cusps longer. Jaws wide, composed of many minute chitinous elements.

Shell very minute and orbicular, or wanting.

Distribution.—Mediterranean, Red Sea, Indian Ocean, Antilles, Australasia, &c.

Sect. 1. Aclesia, Rang, 1828.

Aclesia, Rang, Hist. Nat. Aplys., 68. Type: *Bursatella Savigniana*, Audouin.

Body plump, long-oval, with moderately stout short neck and head, and short conic tail. Sole rather broad. Integument of the whole upper surface bearing numerous digitate or branched appendages, with simple ones among them. Lateral labial processes broad and well developed.

Distribution.—Tropical and southern temperate seas.

1. Notarchus glaucus, Cheeseman, 1878. Plate 36, fig. 1

Aclesia glauca, Chsm., P.Z.S., 1878, 277, pl. 15, f. 4; T.N.Z.I., xi, 1878 (1879), 379, pl. 16, f. 4; M.N.Z.M., 123. *Notarchus glaucus*, Chsm., Man. Conch. (1), xvi, 146, pl. 43, f. 34; Hedley, P.L.S. N.S.W., 1900, 97, pl. 4.

Body from 3 in. to 5 in. long, about ovate when at rest, but capable of considerable extension, a little contracted behind the head, then elevated, and suddenly sloping to a point posteriorly; entirely covered with numerous simple and branched tentacle-like processes, the largest of which are sometimes 8 lines long. *Colour* of the sides pale greyish-brown, passing on the back into a dull sea-green; the whole surface with numerous irregularly shaped black blotches that are longest on the back. Along the back there is also a double row of from 8 to 12 emerald-green specks, each surrounded with a zone of umber. *Dorsal tentacles* $\frac{3}{4}$ in. long, folded down the outer side so as to appear tubular, beset with filiform appendages. *Labial tentacles* similar in shape, but rather larger. *Branchial cavity* large, protected by the folded-in edges of the mantle, branchiæ quite internal. *Foot* long and narrowed, pointed behind, without side lobes as in *Aplysia*: sole pale sea-green. *Mouth* roundish, placed under the head. *Odontophore* with very numerous rows of simple hooked teeth. *Gizzard* strengthened with large triangular calcareous plates. *Shell* none. (Chsm.)

Type (?).

Hab.—Auckland Harbour, rather sandy localities, near the extreme verge of low-water mark (Cheeseman). Also Port Jackson (Hedley).

Remark.—This animal possesses the power of emitting a purple fluid, but only in small quantity, and it may often be handled without anything of the kind being observed.

Tribe 3. PLEUROBRANCHOMORPHA.

Tectibranchs with 2 pairs of tentacles. The foot is devoid of parapodia. There is no pallial cavity, but there is always a single ctenidium situated on the right side, and occupying the space between the mantle and the foot. The genital duct with 2 orifices, without an open seminal groove ; the male and female apertures are contiguous.

Fam. UMBRACULIDÆ, Pilsbry.

Umbrellidæ of authors.

Animal having the foot oval or oblong, adapted for creeping, without pleuropodial process. Head bearing 2 laterally slit tentacles, the eyes sessile at their inner anterior bases. Mantle the size and shape of the shell, with thin serrate edge. Gill a long plume lying between mantle and foot on the anterior and right side, adnate and bearing numerous bipinnate branches for the greater part of its length, posterior end free and bipinnate. Anus tubular, projecting behind the gill. Mouth with labial tentacular or plate-like processes. Radula very broad, bearing a great number of similar, very narrow, crowded, needle-like teeth, with recurved simple cusps, which are not differentiated from the body of the tooth.

Shell external, limpet-like, with the nucleus minute and sinistral, vertex near the centre ; inside with a circular closed muscle-impression.

Distribution.—World-wide in tropical and subtropical seas, laminarian zone and deeper.

Genus 1. UMBRACULUM, Schumacher, 1817.

Umbraculum, Schumacher, Essai Nouv. Syst. Vers. Test., 55, 177. Type : *Patella umbella*, Martyn. *Patella* sp. of the older authors. *Acardo*, Lamarck (in part), 1801 ; not of Commerçon, Bruguière, Cuvier, Mühlfeldt, or Swainson. *Gastroplax*, Blainville, 1819. *Umbrella*, Lamarck, 1819. *Umbella*, d'Orbigny, 1841. *Operculatum*, H. and A. Adams, 1854.

Animal having the foot very fleshy, large, oval, with a deep anterior sinus in which the mouth-parts are situated. Gill a long adnate plume, extending across the front and along the right side, free and bipinnate behind. Verge external, lying in the anterior sinus of the foot, in the median line in front of and below the head. Radula extremely wide, composed of an enormous number of perfectly similar, very narrow, needle-like teeth, strongly recurved toward their apices, the cusps narrowly lanceolate and smooth.

Shell patelliform, depressed, sinistral ; the vertex to the left of and somewhat behind the centre, usually coloured, more or less conically elevated, apex curved backward, when perfect forming a minute spiral of scarcely over one whorl.

Distribution.—The genus occurs in tropical and subtropical seas of both hemispheres.

Fossil in the Eocene of Europe and America.

1. Umbraculum umbellum, Martyn, 1786. Plate 23, fig. 14.

Patella umbella, Martyn, Un. Conch., iii, pl. 102, 1786. *P. sinica*, Gmelin, Syst. Nat., ed. xiii, 1790, 3705. *Umbraculum sinicum*, Gmel., Man. Conch. (1), xvi, 180, pl. 70, f. 58–60; pl. 71, f. 63–65; pl. 72, f. 70, 71. *Patella umbella*, Gmelin, *l.c.*, 3706. *P. umbellata*, Gmel., *l.c.*, 3720. *Acardo umbella*, Lam., Syst. A.s.V., 1801, 130. *A. orbicularis*, Mühlfeldt, Ber. Gesellsch. Naturf. Fr. Berlin, 1811, 63. *Umbraculum chinense*, Schumacher, Essai Nouv. Syst., 1817, 178. *Umbrella indica*, Lamarck, A.s.V., vi, 1819, 343. *Ombrella indica*, Blainville, Man. Conch., 475, pl. 44, f. 1. *Gastroplax tuberculosus*, Blainville, Dict. Sci. Nat., xviii, 177. *Operculatum aurantium*, Pease, Amer. Journ. Conch., iii, 287.

Shell large, oval, inequilateral, depressed. White under a thin straw-coloured cuticle, which is lamellose and brownish toward the periphery. *Vertex* a small conical yellow boss, behind the middle and decidedly nearer the left side, apex recurved. *Disc* with growth-lines and numerous very low unequal radial waves, the margin but slightly undulating. *Interior* brown and conspicuously radially striate inside the muscular scar; white toward the edge.

Breadth, 70 mm.; length, 88 mm.; height, 11 mm. Breadth, 57 mm.; length, 75 mm.; height, 11 mm. (Bay of Islands). Breadth, 42 mm.; length, 51 mm.; height, 8 mm. (Kermadec Islands).

Type lost.

Hab.—Bay of Islands (J. C. Anderson); Kermadec Islands (Captain Bollons). The species occurs from East Africa to the Hawaiian Islands.

Remarks.—It is said that the late Mr. Grosch found a living specimen of an *Umbraculum* north of Auckland, and the shell ought to be in the Strassburg Museum. I wrote to the Director of the Museum, asking for some information on the specimen, but I never got a reply to my letter.

Fam. **PLEUROBRANCHIDÆ**, Gray.

Animal with the inferior tentacles forming a frontal veil; the gill-plume arises about the middle of the right side and extends backward; the dorsal shield is fleshy, stiffened by spicules, and either shell-less, or concealing wholly or mainly a delicate haliotiform shell. The radula is multiserial, without rachidian teeth, and the jaws are well developed, composed of many oblong plates arranged in tessellated pattern; rhinophores present.

The family is world-wide in distribution in tropical and temperate (rarely in cold) seas.

Key to Genera.

A. Mantle with the edge free and overhanging on all sides; rhinophores close together, inserted below anterior edge of mantle on the frontal veil. Shell wholly immersed in the closed mantle. Verge or its foramen close to female orifice .. .. Pleurobranchus.

B. Mantle passing without boundary into the broad anterior veil, the rhinophores far apart, inserted on the surface of united mantle and veil; no shell. Posterior and left borders of mantle passing directly into the integument of the foot, not free .. .. Pleurobranchæa.

Genus 1. Pleurobranchus, Cuvier, 1804.

Pleurobranchus, Cuvier, Ann. du Mus. Hist. Nat., v, 275. Type: *P. Peronii*, Cuvier. *Cleantus*, Leach, 1852.

Body oval; the mantle about the size of the foot, free, and projecting at the edges all around; the rhinophores contiguous, inserted below it, above an expansion of the integument or "veil." Gill bipinnate; male and female generative orifices contiguous or almost united. Jaws composed of elongated plates, almost always denticulated on each side of the terminal point. Teeth of radula unciform, sometimes with a small denticle on the inner side of the 3 to 10 first teeth. Shell haliotiform, auriculate, or spatulate, of variable size in proportion to the size of the animal.

This genus comprises the majority of the species of the family, and is widely distributed.

Subgen. 1. Berthella, Blainville, 1825.

Berthella, Blainville, Man. Malacologie, 1825, 469, 627. Type: *B. porosa*, Blainv. *Berthella*, Vayssière, J. de Conch., xliv, 1896, 115.

Body of animal elongated elliptical and convex; the mantle developed, margins simple and free; rhinophores contiguous; no gland at posterior under-side of the foot. Genital orifices side by side on a common papilla; verge cylindrical.

Pieces of the jaws elongated, lozenge-shaped, usually devoid of lateral denticles. Teeth of radula lamelliform, the inner posterior edge denticulated on its upper half.

Shell auriculate, of medium size.

Distribution.—Atlantic, Amboina, Australasia, &c.

1. **Pleurobranchus ornatus,** Cheeseman, 1878. Plate 23, figs. 15, *a–c*; Plate 37, fig. 6.

Pleurobranchus ornatus, Chsm., P.Z.S., 1878, 275, pl. 15, f. 1, 2; T.N.Z.I., xi, 1878 (1879), 378, pl. 16, f. 1, 2; M.N.Z.M., 124; Man. Conch. (1), xvi, 206, pl. 47, f. 22, 23; Vayssière, Ann. Sci. Nat., Zool., viii, 1898, 337, pl. 14, f. 18, 19.

Animal having the body broadly elliptical, depressed, nearly equally rounded at both ends. *Colour* varying from pale buff to a clear reddish-brown, with irregularly disposed blotches of a rich dark red-brown. *Mantle* large, extending over and concealing both head and foot, quite smooth, margin thin, entire. *Dorsal tentacles* short, stout, abruptly truncate, finely transversely wrinkled, approximate at their origin but gradually diverging at their apices; colour reddish-brown, tipped with white. *Eye-specks* black, placed a little distance behind the tentacles, embedded in the integument, but appearing through it. *Oral tentacles* united in front by a thin semicircular expansion which forms a veil concealing the mouth, and which is carried in advance of the foot. *Mouth* roundish, with fleshy lips. *Branchial plume* placed in the groove between the foot and the mantle, large, the pos-

terior third free, composed of about 22 to 24 leaflets. Genital orifices in front of the gill, close together on a single elongated papilla. *Verge* cylindrical, with a conical sharp point. *Foot* oblong, pale. There are two *jaws* on the upper lip; they are regularly reticulated, the plates lozenge-shaped, with a long and broad median tooth and a tooth-like projection on each side.

The transverse rows of the *radula* are meeting at a blunt angle centrally, and bear very numerous uniform teeth with simple cutting-edges, those in the centre and at the margins smaller than the intermediate ones.

Length of animal, 75–100 mm.

Shell internal, squarish oblong, thin and membranous, semi-transparent, slightly iridescent, closely marked with somewhat irregular concentric striæ or folds. *Colour* varying from nearly white to pale-pinkish or tawny-brown. *Spire* minute, obscure, the aperture occupying the whole of the ventral surface. Length, 12–20 mm.

Type (?).

Hab.—Auckland Harbour, under stones between tide-marks (type); Waiwera (T. F. Cheeseman); Narrow Neck and Takapuna (H. S.); Maloney's Reef (H. S.).

Remark.—The mandibular plates resemble those of *B. granulata*, Kr., figured by Bergh, but the teeth of radula bear no denticles.

Subgen. 2. Bouvieria, Vayssière, 1896.

Bouvieria, Vayssière, J. de Conch., xliv, 1896, 116. Type: *Pleurobranchus aurantiacus*, Risso. *Bouvieria*, Vayssière, Ann. Sci. Nat., Zool., viii, 1898, 280.

Animal ventricose, elliptical; margins of mantle simple (except in *P. scutata*), the foot sometimes produced beyond the posterior margin. Gill bipinnate, relatively small. Genital orifices close together, the verge cylindrical, lightly conic at its extremity. Plates of the jaws with several teeth on each side. Teeth of radula uniform.

Shell auriculate, calcareous, relatively large, and covering the whole of the visceral mass.

Distribution.—Seas of Europe, eastern side of South America, Mauritius, New Zealand.

2. Pleurobranchus aurantiacus, Risso, 1818. Plate 23, fig. 16.

Pleurobranchus aurantiacus, Risso, Journ. de Phys. Chim., Hist. Nat., lxxxvii, 374; Hist. Nat. Europe Mérid., iv, 1826, 40, pl. 1, f. 8: Pilsbry, Man. Conch. (1), xvi, 195, pl. 52, f. 76–80; pl. 74, f. 97–99: Vayssière, Ann. Sci. Nat., Zool., viii, 1898, 281, pl. 13, f. 3; pl. 19, f. 53–55, 58–61; pl. 20, f. 75–76; pl. 28, f. 186: Bergh, Reise Philipp., v, 1898, 120, pl. 9, f. 42–47: Zool. Jahrb. Syst., xiii, 1900, 210, pl. 20, f. 34–38. *P. elongatus*, Cantraine, Bull. Roy. Soc. Brux., ii, 385.

Body ovoid. General *colour* transparent orange, sometimes bright orange or lemon-colour; tissues very delicate. *Mantle* small, not covering either buccal veil, rhinophores, or end of the foot. *Foot* nearly twice as long and as wide as the mantle. *Gill* pinnate, folded

longitudinally, quite long, and with 16 to 25 pinnules on each side; the posterior half of gill free. *Genital orifices* close together, surrounded by a not prominent fold. Length, 20–30 mm.; breadth, 10–15 mm.

Jaws composed of pieces having 5 denticles on each side of the terminal point. *Radula* with formula 70+0+70; the lateral teeth with terminal hooklet but no denticles below it.

Shell auriculate, the spire a little projecting; solid, thick but transparent, of a dull amber-yellow colour, slightly iridescent inside. *Nucleus* very small, about 2 whorls; the concentric growth-lines very distinct.

Diameter, 4·6–8 mm.; height, 8–13 mm.

Hab.—Chatham Islands (Schauinsland); Hauraki Gulf, under stones at low-water mark (H. S.). Mediterranean; the type from Nice; Azores, in 130 fathoms; eastern and western parts of the Atlantic.

Remarks.—I found specimens spawning on the 24th July, 1906.

Genus 2. Pleurobranchæa, Leue, 1813.

Pleurobranchæa, Leue, De Pleurobranchæa novo Moll. Genere, 1813, 1–13, plate. Type: *P. Meckelii*, Blainville. *Pleurobranchidium*, Blainville. *Cyanogaster*, Rudolphi. *Pleurobranchæna*, Meckel.

Body oblong, the united mantle and veil smaller than the foot. Serrate in front and produced at the lateral angles, its edge slightly overhanging on the right side, but not on the left, posteriorly, or in front. Rhinophores inserted far apart, apparently on the mantle. Genital apertures close together. Mouth proboscidiform. Foot with a more or less visible gland on the posterior part of the sole, and a spur or horn on the tail.

Jaws present, composed of elongated plates. Radula without central tooth, the laterals slender, with a single long accessory denticle on the main cusp.

Shell wanting.

The species are few and widely scattered.

Key to Species.

A. Colour dirty-white, with light-brown spots; sole yellowish *maculata.*
B. Colour light grey, with anastomosing greyish-brown lines and white dots; sole grey .. .. *novæ-zealandiæ.*

1. Pleurobranchæa maculata, Quoy and Gaimard, 1832. Plate 23, fig. 17.

Pleurobranchidium maculatum, Q. & G., Voy. Astrol., ii, 1832, 301, pl. 22, f. 11–14. *Pleurobranchæa maculata*, Q. & G., Man. Conch. (1), xvi, 227, pl. 53, f. 88, 89; Spengel, Zool. Jahrb. Suppl., Fauna Chilensis, 1898, 492–94, pl. 29, f. 2–9; Bergh, Reise Philipp., die Pleurobranchiden, 1898, 153, 154; Vayssière, Ann. Sci. Nat., Zool., xii, 49–56, pl. 5, f. 238–50.

Body thick, a little swollen above, covered with low wrinkles. *Colour* dirty-white, with light-brown spots; sole yellowish. *Foot* wide,

rounded at the two ends, and projecting beyond the mantle behind. *Veil* continuous with the mantle, wide, arcuate, crenulated, and terminating in 2 points; surmounted behind by the 2 short auriform tentacles. *Gill* fusiform, free at the end, formed of parallel and oblique foliations, generally uncovered. *Verge* almost always projecting, large, and 9–11 mm. long. *Anus* opens above and past the middle of the gill. *Mouth* at the end of a small rostrum.

Type in the Mus. Hist. Nat., Paris.

Hab.—The type is from Port Western, Australia. It is said that in 1843 Belligny and Laucan each found one specimen on the shores of New Zealand. Also Juan Fernandez Island.

I have not seen this species.

2. Pleurobranchæa novæ-zealandiæ, Cheeseman, 1878. Plate 36, fig. 2.

Pleurobranchæa novæ-zealandiæ, Chsm., P.Z.S., 1878, 276, pl. 15, f. 3: T.N.Z.I., xi, 1878 (1879), 378, pl. 16, f. 3: M.N.Z.M., 124: Vayssière, Ann. Sci. Nat., Zool., viii, 338, pl. 15, f. 28: Bergh, Reise Philipp., v, 1898, 150, 154: Zool. Jahrb. Syst., xiii, 1900, 208, pl. 20, f. 56, 57; pl. 21, f. 69.

Body oval, convex, thick and fleshy, smooth and lubricous to the touch, but the whole surface nevertheless covered with minute puckers and folds. *Colour* light grey, copiously streaked with irregular anastomosing lines of dark greyish-brown, and sprinkled with numerous minute and almost microscopic white dots. *Mantle* smooth, not nearly so long as the foot, and not concealing the branchiæ, rather broader on the right side; oral veil broad, extending over and concealing the mouth, in front semicircular, and with a delicate fringed margin, but on each side produced into the short auriform tentacles. *Mouth* large, round, in a state of rest concealed in the sulcus between the veil and the foot, but capable of being greatly protruded. The *rhinophores* wide apart, short and stout, projecting outwards, folded down the outer side, tips obliquely truncate. *Eyes* minute, black, immersed in the integument at the inner bases of the tentacles. *Foot* long, extremely flexible, sole pale ashy-grey. *Branchial plume* often over 25 mm. in length, the posterior half free; leaflets about 17, finely ciliated. Length, 65–80 mm. *Jaws* two, large, finely and regularly reticulated or faceted, the plates mostly consisting of hexagonal prisms. Teeth of *radula* numerous, acuminate, with a single slender cusp on the main tooth.

Type (?).

Hab.—Auckland Harbour, type (T. F. Cheeseman); Shelly Beach and St. Helier's (H. S.); Akaroa Harbour (Schauinsland, H. S.); on sandy flats, not uncommon in the winter and spring months; Wellington Harbour (Hutton).

Subsp. **granulosa**, Bergh, 1900.

Zool. Jahrb. Syst., xiii, 1900, 209.

Colour of dorsal surface dirty-brown, lightly marbled with black, as is also the upper side of the foot; the gill is brownish-grey, the foot yellowish-white. *Back* thickly covered with small oval or roundish granules of 0·5–1 mm. diameter, and the same granulations are present on the upper side of the foot and the anterior margin of the veil. The auriform *tentacles* with a strong furrow on the under-side. *Gill* with about 30 leaflets on each side. Gland at the posterior end of sole not distinct, pear-shaped, 3·5 mm. long. There is no papilla on the tail. *Jaws* and *radula* as in the type.

Length, 2·5 cm.; breadth, 1·5 cm.; height, 1 cm. Breadth of veil, 12 mm.; height of rhinophores, 2·5 mm.: length of gill, 5·5 mm.; breadth, 3·2 mm.

Type in the Naturhist. Museum, Bremen.

Hab.—French Pass, type (Schauinsland); Te Onepoto, near Lyttelton (H. S.).

Suborder 2. NUDIBRANCHIA, Cuvier.

Naked Opisthobranchs without a shell in the adult state; without ctenidium and osphradium. These animals are generally slug-like and exhibit an external symmetry. The visceral mass, except in the *Hedylidæ*, is no longer a sac marked off from the foot, and the dorsal integuments frequently give rise to appendages which are subservient to respiration. The nervous system is much concentrated; the ganglia are generally united on the dorsal side of the œsophagus; the supra-intestinal and infra-intestinal ganglia are fused with the pleurals; the fusion is sometimes carried to a great extent, but the several infra-œsophagal commissures (pedal, visceral, and stomato-gastric) always remain distinct. The visceral commissure is always reduced, and is generally without a ganglion. Accessory stomato-gastric or "gastro-œsophageal" ganglia are present. The genital gland or gonad is subdivided into male and female acini, except in the *Elysiomorpha*.

The *Nudibranchia* are marine, generally carnivorous, and brightly coloured, affording many instances of mimicry. There is no osphradium, but its absence is compensated by the increased development of the olfactory organ, or rhinophore. In ontogeny the free veliger stage of Nudibranchs is followed by a planariform creeping stage, during which the shell is rapidly lost; and finally the dorsal appendages are acquired, notably the dorsal papillæ of the Eolids, of which the most anterior are first to be developed.

Tribe 1. TRITONIOMORPHA.

Nudibranchia in which the liver is wholly or partially contained in the visceral mass. The anus is lateral, on the right side. There are generally 2 rows of ramified dorsal appendages. The genital duct is diaulic; the male and female orifices contiguous.

Fam. **TRITONIIDÆ**, Adams.

The body is elongated and slightly quadrangular, the anterior portion is broader, the posterior narrowed; the dorsal surface is flattened and granular in appearance; the sides of the body are high and perpendicular; the foot is broad. At the anterior extremity the back acquires a crescentic prominence, the frontal veil; the free margin of this is covered with small papillæ, or with simple, sometimes compound, finger-shaped processes; the outer extremity is thickened, and forms a spoon-shaped structure, the tentacle proper. The rhinophores are situated on the neck, just behind the frontal veil. The sheath of the rhinophores is tubular and slightly depressed, with a recurved margin; the sword-knot-shaped club is retractile, the central portion has a flattened upper surface, the margin is set with erect feather-like processes, the rhachis of the hindermost process is continued into a rather strongly developed papilla. On the slightly prominent margin of the back there are a number of variously sized branchial tufts, arranged one behind the other in a single series; they are low, more or less arborescent, tri- or quadri-pinnate, and are set on a short stalk. The anal papilla and the renal aperture are situated close to each other about the middle of the body, on the right side. The foot is rather broad and rounded at its anterior end; the tail is very short.

There are 2 well-developed jaws. Radula with a central tooth, on each side of which is a series of uncinate teeth; the first lateral tooth always differs from the rest.

The *Tritonidæ* are carnivorous animals, feeding chiefly on Alcyonarians and allied forms.

Distribution.—Seas of Europe, Red Sea, Pacific, Cape of Good Hope, Brazil, New Zealand.

Genus 1. Tritonia, Cuvier, 1798.

Tritonia, Cuvier, Tabl. Elément., 1798, 387. Type: *T. Hombergi*, Cuv.
Sphærostoma, Macgillivray. *Liriope*, Gist. *Candiella*, Gray.

Body prismatic, often thick and firm. Rhinophores 2, ramose and filamentous, more or less brush-shaped, retractile within tubular sheaths. Head with a tuberculated or digitated veil. Branchial tufts ramose, arranged in a single series along the ridge bordering each side of the back. Mouth armed with 2 horny jaws. Central tooth of radula large, depressed, subpyramidal, the first lateral tooth of the same form as the central, the others uncinate. Stomach unarmed.

The genus is probably cosmopolitan, but specially frequent in colder seas. (Eliot.)

1. Tritonia incerta, Bergh, 1904.

Tritonia incerta, Bergh, Reise Philipp., ix, Malacolog. Unters., pt. 6, 1904, 24; Benham, T.N.Z.I., xxxvii, 314.

Animal having the form usual in the genus. The *buccal veil* carries altogether 7 finger-shaped lobes. The *tentacles* have the usual form.

The retracted *rhinophores* are 3·5 mm. high, with the usual structure. The *back* is finely tuberculated. The short arborescent *gills*, numbering 13–14 on each side, are nearly of equal size. The *anus* is situated below the fifth gill. The *genital pore* as usual. The *foot* is narrowed in front and behind; the margin relatively thin; the *tail* (metapodium) short. *Colour* of animal, in alcohol, yellowish-white.

Dimensions.—The length is 4 cm., with a breadth (without the gills) of 1·5 cm., and a height of 1·3 cm. The breadth of the buccal veil is 10 mm., its lobes 2·5 mm., and the tentacles 2 mm. The height of the rhinophore-sheath is 4 mm.; the height of the gills is 4 mm.; breadth of the sole of the foot, 15 mm.; length of tail, 3 mm.

Hab.—One specimen was obtained by trawling between Kaipara and New Plymouth (s.s. "Doto," 1901).

Remark.—This form can scarcely be identified with any of the *Tritonias* from the Pacific hitherto sufficiently studied; it is distinct from *T. Challengeriana* and *T. dioncedca*, while from *T. exsulans* it differs in the buccal veil and the number of teeth of the radula.

Tribe 2. DORIDOMORPHA.

Nudibranchia with external symmetry, in consequence of the median position of the anus, which is posterior and generally dorsal, and surrounded by ramified pallial appendages constituting a secondary branchia. The liver is not ramified in the integuments. The genital duct triaulic. Spicules present in the mantle.

Fam. GONIODORIDIDÆ, Adams.

Mantle-border projecting; frontal veil reduced, and often covered by the anterior border of the mantle.

Genus 1. Goniodoris, Forbes, 1840.

Goniodoris, Forbes, A.M.N.H., v, 1840, 104. Type: *Doris nodosa*, Montagu. *Pelagella*, Gray, 1850.

Body oblong or lanceolate, not much depressed, smooth or granulated, the granules sometimes arranged in rows. Mantle small, exposing the head and foot, not furnished with appendages. Rhinophores clavate, laminated, not retractile nor invested with sheaths. Branchia not retractile, arranged in a circle round the anus, the plumes simply pinnate. Head advancing, with flat tentacles. Jaw with small hooks or tubercles. Radula without central teeth, with the first lateral tooth large, unciform. Verge armed with rows of hooklets.

Only few species are known, chiefly from the Atlantic, Indian, and Pacific Oceans, and from the Mediterranean.

Key to Species.

A. Branchial plumes 7–9, tripinnate; body brown, rarely pale, with white spots .. .. *castanea.*
B. Branchial plumes 5–6, bipinnate; body yellowish-green, with brown dots .. .. *punctata.*

1. Goniodoris castanea, Alder and Hancock, 1846.

Goniodoris castanea, A. & H., Ann. Nat. Hist., xvi, 314: and Monog., pt. 3, 1846, fam. 1, pl. 19; pt. 7, 1855, pl. 46, supplem.: Bergh, Malak. Blätter, neue Folge, ii, 1880, 126, pl. 4, f. 14–21; Reise Philipp., Malac. Unters., vi, pt. 2, 1904, 89, pl. 6, f. 12–14; Forbes and Hanley, Brit. Moll., iii, 572. *Doris Paretii*, Verany, Catalogo, 1846, 22, pl. 2, f. 4, 5; J. de Conch., iv, 1853, 388.

Body ovate, rather broad and depressed, of a reddish or chestnut-brown colour, rarely pale, covered with small conical tubercles, spotted with opaque-white. *Mantle* narrow, carinated centrally with an ample reflected smooth sinuous margin, indented deeply behind. *Rhinophores* rather short, bent backwards, 10 to 12, laminated, but sometimes there are 15 to 20 laminæ. *Buccal tentacles* broad, very large, with acuminated tips. *Branchial plumes* large, tripinnate, 7 to 9 in number, forming a complete circle of a deep chestnut colour round the vent. *Foot* broad and expanded.

Length, 30 mm.; breadth, 18 mm.; height, 10 mm. (alcohol specimen).

Jaw very narrow, consisting of granular thickenings of the cuticle. Teeth of *radula* hooked; the marginals with a broad base and a small denticle.

Hab.—One specimen found on the hull of H.M.S. "Ringarooma" when in Otago Harbour (Professor Benham).

The type was discovered between tide-marks at Salcombe, in Devonshire, by Mr. Alder. It also occurs in the Mediterranean.

2. Goniodoris punctata, Bergh, 1905.

Goniodoris punctata, Bergh, Reise Philipp., Malac. Unters., vi, pt. 2, 1904 (1905), 91, pl. 6, f. 15–22; Eliot, P. Mal. S., vii, 1907, 349.

Body 6–9 mm. long and of a uniform yellowish-green, with numerous reddish-brown dots, sometimes wanting. The *dorsal margin* has a jagged appearance, as it is marked by a line of 7–10 simple lancet-shaped processes on each side. Similar processes, 5 to 6, are found on the *frontal margin*. On the *dorsal surface* are scattered tubercles, about 5 in front of the rhinophores and 20 between the rhinophores and branchiæ. The part behind the branchiæ is smooth. The *tubercles* form 3 extremely irregular rows, of which that in the middle is most definite. The *head* is produced into a blunt projection on either side. The *foot* is not grooved in front and not produced at the corners. The *rhinophores* are rather large; they bear about 10 perfoliations, and show no trace of sheaths or pockets. The *branchiæ* are 5 or 6, scanty and bipinnate.

Length, 9 mm.; height, 3 mm.; breadth, 3 mm. (largest alcohol specimen).

The *internal organs* are described by Bergh. On the labial cuticle is a ring (apparently consisting of two semicircles which nearly meet) composed of small rods with tips sometimes entire and sometimes divided. The formula of the *radula* is $31 \times 2 + 0 + 2$. The teeth are transparent. The inner tooth is large, and bears at least 20 denticles. The outer tooth is a small plate, bearing in most cases a single low but distinct cusp.

Co-type in my collection.

Hab.—Near Akaroa Harbour, in about 8 fathoms (H. S.).

Genus 2. Acanthodoris, Gray, 1850.

Acanthodoris, Gray, Figs. of Moll. Anim., iv, 1850, 103. Type: *A. pilosa*, Müller.

Body depressed, oval, convex; mantle moderate, covered with soft papillæ; oral tentacles united in a veil, with free flattened lateral ends; rhinophores retractile within denticulated sheaths, their clubs beautifully laminated. Branchia formed of tripinnate plumes arranged in a circle. Jaws composed of small denticles or hooks. Radula without a central tooth, a large unciform lateral and several small marginal teeth.

Distribution.—North Atlantic, North Pacific, New Zealand, Tasmania. The genus is characteristic of the colder seas, and is not recorded from the tropics.

Key to Species.

A. Mantle with small, scattered, soft, conical, and pointed tubercles .. *globosa.*
B. Mantle with large, linear, soft papillæ, especially numerous at the sides and around the branchiæ .. .. *molicella.*

1. Acanthodoris globosa, Abraham, 1877.

Acanthodoris globosa, Abrah., P.Z.S., 1877, 262, pl. 30, f. 5–9; M.N.Z.M., 128; Eliot, P. Mal. S., vii, 329, 350.

Body ovate, broad, very convex and inflated. *Mantle* membranous on the back and sides, reaching down over the foot, except perhaps quite behind, and bearing scattered, soft, conical, pointed tubercles, which are more numerous towards the border. The *integuments* are very thin and the *dorsal tubercles* sparsely scattered. The *rhinophores* are apparently rather short and slender, laterally flattened, and retractile within the sheaths, of which 2 of the marginal processes are larger than the others. *Branchiæ* 7, bi-(? tri-)pinnate, non-retractile, situated around the anus, far back and low down. *Oral veil* short, very wavy, the sides prolonged, free and flattened. *Foot* broad, truncate in front, with a very indistinct transverse groove; it is rounded behind, and the margin all around is very wavy. *Colour* (in spirit) transparent white, with a blue coloration on the back and

sides ; Eliot thinks that the original colour may have been black or bluish ; under-side of the mantle marked with reddish lines formed by spicules ; some of the lower tubercles have a reddish or brownish tinge at the base ; the rhinophores are faint purplish, becoming lighter at the apex ; the branchiæ are variegated with grey ; foot and oral veil yellowish-white.

Length, 21 mm. ; breadth, 13 mm.

Having examined a type specimen, Sir Charles Eliot gives the following supplementary details : Contrary to Abraham's statement, the labial armature with the 2 blades is quite distinct. It is formed of mace-like elements, swollen below the tip, but ending in a point, and not denticulate or divided. They are set in unusually regular rows. The formula of the radula is about $34 \times 7 + 1 + 0 + 1 + 7$. The first lateral is of the usual shape, and bears 3–4 denticles. The second to sixth laterals are all erect, and, though much smaller than the first, retain something of the hamate shape. The seventh is a flat plate.

Type in the British Museum.

Hab.—New Zealand, exact locality unknown.

Remark.—This is possibly identical with *A. metulifera*, Bergh (in Semper's Reise Philipp., Malac. Unters., vi, 2, 98, 1905), described from a single specimen obtained in Tasmania ; but there are differences of detail in the radula and labial armature. (Eliot.)

2. Acanthodoris molicella, Abraham, 1877.

Acanthodoris molicella, Abrah., P.Z.S., 1877, 262, pl. 30, f. 1–4 ; M.N.Z.M., 28 ; Eliot, P. Mal. S., vii, 329, 349. *? A. pilosa novæ-zealandiæ*, Bergh, Semper's Reise Philipp., Malac. Unters., vi, 2, 94, pl. 6, f. 23–26 ; pl. 7, f. 1.

Body ovate, convex, soft. *Mantle* covering the back and sides, but not extending over the border of the foot ; bearing above large, long, linear or subconical soft papillæ, which are larger than is usual in the genus, and are especially numerous at the sides and around the branchiæ. *Rhinophores* long, slender, pointed, apparently conical and laminated far down ; the denticulated sheath, through which each is retractile, has 2 of the antero-lateral divisions enlarged and produced into 2 long, flat, conical papillæ. *Branchiæ* 7 to 9, bipinnate, non-retractile, their bases united, and set in a star round the short tubular anal opening. *Oral veil* short from before backwards, with the lateral ends free and flattened. *Foot* broad and oblong, truncated (or the outline curving inwards) in front, and without a transverse groove ; it is flatly rounded behind, and the border all round is flattened, crenulate, and extending beyond the mantle, particularly posteriorly. *Colour* (in spirit) uniform olive-brown.

Length, 28 mm. ; breadth, 18 mm. (alcohol specimen).

Sir Charles Eliot, who examined a type specimen, supplies the following additional information : The labial armature, with its

cuticular blades, is as usual in the genus. It is composed of little columns split into 3 or 4 denticles at the top, and presents a very rough surface, almost like a radula. The formula of the radula is about $24 \times 6 + 1 + 0 + 1 + 6$. The first laterals are large, with rather blunt tips, and bear 4–5 denticles. The second to fourth laterals are erect, and retain the hamate form. The fifth and sixth are plates.

Type in the British Museum.

Hab.—Auckland Islands (type); Sumner, near Lyttelton (H. S.).

Remarks.—Bergh thinks that his *A. pilosa novæ-zealandiæ* is probably identical with *A. molicella*, Abrah., and this view is shared by Eliot. The latter, however, doubts if it is really the same species as *A. pilosa*, though undoubtedly nearly allied. The dorsal papillæ are longer, and there are differences in the rhinophore-sheaths, labial armature, and radula. The internal organs are described by Bergh.

Fam. DORIDIDÆ, Gray.

Body of variable form, generally depressed. Mantle oval, covering the head and the greater part of the body. Buccal tentacles ill-developed. Branchiæ generally retractile, on the posterior or medio-posterior part of the back, usually forming a circle round the anus. Skin strengthened with spicules, more or less definitely arranged. Radula multiserial.

Genus 1. DORIS, Linné, 1758.

Doris, Linné, Syst. Nat., ed. x, 653. Type: *D. verrucosa*, L. *Argus*, Bohadsch, 1761.

Body elliptical, depressed, rarely convex, covered by an ample mantle, the surface of which is in most species tuberculated, and the margins extend over the head and the sides of the foot; variously coloured. Head hidden by the mantle, furnished with an oral veil, which is sometimes produced into 2 labial tentacles. Rhinophores subclavate, laminate, retractile within a cavity. Branchiæ tri- or quadri-pennatifid, surrounding the vent, which is placed medially on the posterior portion of the back. Genital orifice at the right side.

The species of this genus inhabit for the most part the littoral and laminarian zones, and appear to be carnivorous. They are found in all parts of the world, and are often of large size and exquisite beauty.

Subgen. 1. ARCHIDORIS, Bergh, 1892.

Archidoris, Bergh, Syst. d. Nudibr. Gasterop., in Semper's Reise Philipp., v 1092. Type: *A. tuberculata*, Cuvier.

Animal of soft consistency, plump, and slightly depressed; back more or less granular or tuberculate, the openings for the rhinophores simple. Tentacles short, thick folds at the sides of the small head, with an external furrow. The retractile gill composed of a few tri- or quadri-pinnate leaves. Foot broad, with a furrow at the anterior

margin. The labial disc merely clothed by a simple cuticle. The radula without central tooth, with numerous hook-shaped plates on either side from the middle. The large ventricle free. Verge and vagina unarmed.

Only a small number of species are known. The genus is probably cosmopolitan, but most abundant in temperate seas.

KEY TO SPECIES.

A. Back entirely covered with hemispherical papillæ of various size; gill formed of 5–7 tripinnate members, the anal papilla completing the branchial circle posteriorly .. *nanula.*
B. Back with large tubercles, smaller and more crowded towards the margin; gill formed of 8 tripinnate members, the anal papilla nearly central .. .. *violacea.*
C. Back with large rounded tubercles, with small white tubercular spots between them; gill formed of 7 tri- sometimes quadri-pinnate members, the anal papilla subcentral .. *wellingtonensis.*

1. Doris nanula, Bergh, 1904.

Archidoris nanula, Bergh, Semper's Reise Philipp., Malac. Unters., vi, 1904, 33, pl. 3, f. 2; Benham, T.N.Z.I., xxxvii, 316; Eliot, P. Mal. S., vii, 328.

Form as usual. The *back* entirely covered with almost hemispherical papillæ, not very variable in size, but somewhat smaller at the mantle-edge. The club of the *rhinophore* is much foliated, the foliæ stiffened in the usual way with long spicules. The *branchial region* is in all the individuals much everted, and surrounded by the narrow lip of the distended gill-opening (which measures 6 mm. in diameter). The *gill* is formed of 5 to 7 tripinnate members; the upright anal papilla completes the branchial circle posteriorly. The under-surface of the mantle-edge is smooth; the *tentacles* appear to be shortly conical; the *foot* is fairly broad, rounded in front, with a short tail. *Colour:* During life the animals are light-orange-coloured; in alcohol they are entirely yellowish-white.

Length, about 18 mm.; breadth, up to 14 mm.; height, 3 mm. Height of the gills, 4·5 mm.; breadth of the foot, 7 mm.

Hab.—Collected by Professor Benham from the hull of the s.s. "Ringarooma," when in dry dock at Port Chalmers, after being at moorings for about a year in Deborah Bay.

Remarks.—This form is undoubtedly an *Archidoris*, but whether it represents a distinct species must remain for the present undecided (Bergh). Perhaps identical with an East African form (Eliot).

2. Doris violacea, Bergh, 1904.

Archidoris violacea, Bergh, Semper's Reise Philipp., Malac. Unters., vi, 1904, 31, pl. 2, f. 36, 37; pl. 3, f. 1: Benham, T.N.Z.I., xxxvii, 315: Eliot, P. Mal. S., vii, 328.

Form of the animal a longish oval, the back fairly arched. The *tubercles* towards the margin of the back are smaller and more crowded. The *rhinophores* are closely foliated. The *gills*, situated far back, are

formed of 8 tripinnate members, of which the hindermost are slightly smaller. The anal papilla is nearly in the centre of the branchial crown. The *mantle-edge* is of nearly the same breadth throughout; its under-surface smooth. The *foot* is rounded in front, with well-defined marginal groove; the margin is not very narrow; the tail short. *Colour* of living animal a fine violet, with orange-coloured tentacles and foot. Preserved animals are yellowish-white. The living animal attains a length of over 150 mm., and a breadth of 60 mm. The dimensions of a preserved specimen are: length, 40 mm.; breadth, 25 mm.; height, 17 mm.

The internal organs have been described by Bergh.

Co-type in the Otago Museum, Dunedin.

Hab.—Between Otago Peninsula and Oamaru, in 30 to 40 fathoms, obtained in numbers by trawling; Wellington Harbour (A. Haylock).

Remarks.—From its coloration, this form probably represents a new species; possibly it is identical with one or other of the species recently described from the Pacific Ocean (Bergh). Perhaps identical with an East African form (Eliot).

3. **Doris wellingtonensis,** Abraham, 1877. Plate 36, fig. 3.

Doris wellingtonensis, Abrah., P.Z.S., 1877, 211, 259, pl. 29, f. 27: M.N.Z.M., 127: Eliot, P. Mal. S., vi, 1905, 236; vii, 328, 335. *Onchidoris tuberculatus,* Cuvier, C.M.M., 54; not of Cuvier. *Doriopsis lacera,* Cuvier: Bergh, Chall. Rep., x, 121; not of Cuvier.

Body oval, convex, swollen. *Mantle* thick, fleshy, not extended or flattened at the border; covered with large rounded flat pustules, between which are scattered small opaque whitish tubercular spots; the upper surface harder than the under, with an almost scaly feeling. *Rhinophores* small, clavate, compressed from before backwards, each with more than 26 small laminæ, lying between shallow longitudinal depressions, and extending low down; the apices are styliform, and marked with laminæ, except at the extreme rounded tip; they are retractile through large wide fleshy sheaths. *Branchiæ* 7, tripinnate, sometimes quadripinnate, relatively small, but much ramified; the anal papilla is subcentral; the whole system is retractile within a large deep cavity, the margin of which is crenulate and wavy, and can be contracted completely over them. *Oral tentacles* short, thick, tubercular, truncated, and with a central pit on the apex, which, however, is most likely due to distortion by the preserving fluid. *Foot* oblong, broad, fleshy, flatly rounded, and with an anterior groove; posteriorly it is obtusely acuminated. *Colour* of the living animal dirty yellowish-orange on the back; branchiæ paler; foot and rhinophores bright orange.

Length, 42 mm.; breadth, 30 mm. (type). Length, 137 mm.; breadth, 84·5 mm.; height, 42·5 mm. (large specimen).

Radula consisting of 30 to 50 rows of teeth; there is no rhachidian tooth, as erroneously stated by Hutton. On either side of the rhachis

are 50 to 65 teeth ; the first lateral projects almost at right angles into the rhachis. It has a short low hook, and a long thick base. The first 15 teeth on either side are rather low, with a long base, so that the lower part of the back is a mere lamina. The three outermost are thinner and smaller. None are denticulate. The teeth are figured by Hutton (T.N.Z.I., xiv, pl. 6, f. G). Mantle-spicules are absent. The other internal organs have also been described by Sir C. Eliot.

Type in the British Museum.

Hab.—Auckland to Dunedin, in sheltered rocky places ; not common.

Remark.—This species is restricted to New Zealand.

Undetermined Species.

Doris granulosa, Abraham.

Doris granulosa, Abraham, P.Z.S., 1877, 253, pl. 29, f. 1–3 ; M.N.Z.M., 126 ; Eliot, P. Mal. S., vii, 344.

Several specimens of this form are in the British Museum, and appear to correspond with Abraham's description of the external characters. I opened two, but found the internal organs, including the ribbon of the radula, entirely decayed. Only scattered teeth of the ordinary hamate type remained.

The form is probably a small *Archidoris*—perhaps *A. nanula*, Bergh —but its appearance in life is unknown, and the preserved specimens present no characters which would justify identification. The species can accordingly be neglected. (Eliot.)

Doris longula, Abraham.

Doris longula, Abraham, P.Z.S., 1877, 253, pl. 29, f. 4, 5 ; M.N.Z.M., 126 ; Eliot, P. Mal. S., vii, 345.

The same may be said of this form. Like *D. granulosa*, it has lost its colour, the intestines are decayed, and it can only be said that it had rather stout hamate teeth.

Hutton (T.N.Z.I., xiii, 203) doubtfully identifies with *D. longula* specimens deposited by him in the Canterbury Museum, but his description is not full, and it is difficult to say whether his animal is really the same as Abraham's, or to what genus either is referable. (Eliot.)

Archidoris sp.

Archidoris sp., Bergh, Semper's Reise Philipp., Malac. Unters., vi, 1904, 34 ; Benham, T.N.Z.I., xxxvii, 317.

The animal was somewhat hard and stiffened ; the back fairly smooth, but finely granulated towards the margins ; the rhinophores, lying far forward, have the club much foliated. The foot is large ; its margin not broad ; the tail short. Colour in life, pale orange.

Length, 23 mm. ; breadth, 16 mm. ; height, 10 mm.

Hab.—Kaikoura, one specimen (Professor Benham).

Remark.—This form is probably identical with one of the recently described species of the genus. (Bergh.)

Subgen. 2. Homoiodoris, Bergh, 1882.

Homoiodoris, Bergh, Verhandl. Zool. Bot. Gesellsch. Wien, xxxi, 1882, 222. Type: *H. japonica*, Bergh.

The characters are those of *Archidoris*, differing only in the genitalia, the prostatic gland being large and the vagina armed.

4. Doris novæ-zealandiæ, Bergh, 1904.

Homoiodoris novæ-zealandiæ, Bergh, Semper's Reise Philipp., Malac. Unters., vi, 1904, 35, pl. 3, f. 3–7 ; Benham, T.N.Z.I., xxxvii, 317 ; Eliot, P. Mal. S., vii, 328.

Animal having the form of Archidorids ; consistency somewhat stiff. The *colour* of the back is whitish or faintly yellowish-white ; the tubercles white ; the head and foot inclining to yellowish ; the clubs of the rhinophores and the gill are chrome-yellow ; one individual had the under-surface of the mantle-edge spotted with violet-grey. The *back* is covered pretty closely with tubercles of dissimilar size, somewhat flattened on the apex (at least in the case of the larger ones) ; they attain a height and diameter of about ½ mm. Similar tubercles are also present at the edge of the rhinophore-pits and gill-aperture. The club of the *rhinophore* bears about 20 foliæ ; the branchial aperture is transversely oval ; the gills number 5 or 6 ; the cylindrical anal papilla is relatively high (1 mm.). The under-surface of the mantle-flap is smooth ; the sides of the body angular. The *foot* has a distinct groove at its anterior edge ; the *tail* is short. *Tentacles* short, thick, with grooves on the under-side.

Dimensions of specimens preserved in alcohol : Length, varying from 12 mm. to 20 mm. Largest specimen : Breadth, 13 mm. ; height, 7 mm. ; width of mantle-flap, 3·5 mm. Length of foot, 16 mm. ; breadth, 7 mm.

Hab.—Port Chalmers (Professor Benham).

Remarks.—Whether this form belongs to the genus *Homoiodoris* remains for the present undecided, since the most essential character—the armature of the vagina—was not established. It may belong to the genus *Artachæa*, Bergh (Syst. Nudibranch. Gastropoda, 1892, 1093), or a new genus will have to be formed.

Subgen. 3. Ctenodoris, Eliot, 1907.

Ctenodoris, Eliot, P. Mal. Soc., vii, Sept. 1907, 338. Type: *C. pecten*, Eliot.

These forms have the ordinary characteristics of the *Archidoridæ*. The back is tuberculate, the teeth simply hamate, and there is no armature on the labial cuticle or genitalia. But the structure

of the branchial apparatus is remarkable: not only are the plumes simply pinnate, as in *Staurodoris*, but they are arranged in a line or crescent, and the upper lip of the pocket shuts down over them like a single valve.

Only two species are known—the type, which is from the Maldive Archipelago, and the New Zealand form.

5. **Doris flabellifera**, Cheeseman, 1881. Plate 37, fig. 2.

Doris (?) *flabellifera*, Chsm., T.N.Z.I., xiii, 1880 (1881), 222; Eliot, P. Mal. S., vii, 1907, 328, 339.

The *back* is covered with low inconspicuous warts of various sizes. The edges of the rhinophorial pockets are not protected by distinct tubercles, and only slightly raised. The *rhinophores* are large and stout. The branchial pocket is bilobed. The upper and anterior valve or flap is bow-shaped; the posterior valve is somewhat more rounded, and the two enclose a fairly wide space shaped like a crescent with the ends pointing forward. The *pocket* is very shallow, and is not protected by any special tubercles; its membranous floor is raised in a dome-like elevation. From either corner of the anterior valve a nearly straight row of thin simply pinnate branchiæ extends towards the middle, slightly increasing in size, the two median plumes being the largest, and lying just above the anal papilla. There are 22 *plumes* in all, but varying from 18 to 26. The *foot* is rather small, grooved, but not notched in front. The large buccal mass is (in spirit specimens) protruded; on either side of it is a flat tentacular fold with traces of a groove. *Colour* pale yellowish-orange, sometimes sprinkled with a few minute blackish specks. *Mantle-spicules* very numerous, straight or slightly bent, thickest in the middle, and tapering gradually to the extremities. The *eyes* are sessile and rather large.

Length, 21 mm.; breadth, 13 mm.; height, 5 mm. Foot, 12 mm. long and 7 mm. broad. The mantle-margin is ample, and in places as much as 5 mm. broad.

There is no armature on the labial cuticle. The *radula* consists of 35 to 40 rows, with a formula of about 50+0+50. The teeth are white, strongly hamate, not denticulate, and with long bases. There is no median tooth, but the first laterals project into the rhachis one behind the other. The inner teeth, particularly the first 6–7, are smaller than the rest; then the size goes on increasing until almost the end of the row; the last three, especially the outermost of all, are smaller, but not much degraded, and not denticulate. The stomach contains small gastropod shells.

Further anatomical details are to be found in Sir Charles Eliot's paper.

Hab.—Not uncommon between tide-marks in Auckland Harbour, feeding on sponges and corallines (T. F. Cheeseman); Snares (Professor C. Chilton).

Genus 2. Rostanga, Bergh, 1879.

Rostanga, Bergh, Archiv. für Naturgesch., 1879; Gatt. Nörd. Doriden.
Type: *Doris coccinea*, Forbes.

Animal having the back of the body covered with minute rough tubercles; branchiæ simply pinnate. A labial armature is present. The teeth of the radula are of two different kinds—the inner teeth are short and hooked, with a broad base; the external teeth are long, thin, and bifid.

Key to Species.

A. Mantle with minute cylindrical tubercles, crammed with straight granulated spicules; gill formed of 9 simple or bipinnate members .. .. *muscula.*
B. Mantle densely covered with erect small tubercles; gill formed of 8 bipinnate members .. .. *rubicunda.*

1. Rostanga muscala, Abraham, 1877. Plate 23, figs. 23, *a–d*.

Doris muscula, Abrah., P.Z.S., 1877, 205, 256, pl. 29, f. 6, 7; M.N.Z.M., 126,
Rostanga muscula, Abrah.: Eliot, P. Mal. S., vii, 1907, 328, 339.

Body elliptical, convex. *Mantle* covering the head and the foot, but not laterally flattened or extended into a border; it is covered above with minute cylindrical tubercles, twice as long as they are broad, and crammed with straight granulated spicules, which are often swollen in the middle. *Rhinophores* retractile into cavities of which the borders appear to have been raised in life and to have borne small pointed tubercles. The *branchiæ*, 9, simply pinnate or bipinnate, small, retractile; the margin of the cavity is fringed with small elongated tubercles. The *oral tentacles* are distinct, linear, and rather flat. *Foot* oblong, rounded at the ends, with a deep transverse groove in front and the upper lamina notched; it does not extend behind as far as the mantle-edge. *Colour* (in spirit) greyish, with an indistinct brownish longitudinal band extending from the rhinophores to the branchiæ, and bordered on either side by a bluish band, the colour being due to pigment disposed between the dorsal tubercles in a reticulate pattern, but not on them.

Length, 13 mm.; breadth, 9 mm. (type).

There are small granules or columns in the labial cuticle, but they are not arranged in a plate. The formula of the *radula* 69 × about 82 + 0 + 82. The innermost lateral is hamate, and bears on the inside numerous (30 or more) fine comb-like denticles. The second to the eighth laterals are also hamate; the shaft is slender and pointed, the base stout with a large projection. These teeth gradually pass into the third form, which prevails from 9 to 36. The shaft gradually grows longer and the base smaller, until the whole tooth has the shape of a hook on a pedestal. In the remaining 45 teeth the base is still smaller, the shaft is longer, and the end is split into 2–4 long denticles, forming a brush at the tip. These teeth resemble filaments rather than the ordinary teeth of Dorids. As preserved, they lie in

bundles on the top of the other teeth, being apparently set higher up on the sides of the buccal cavity. Their bases are so close together that they seem to be fused, but this is not really the case : each tooth is separately attached to the basal membrane. (Eliot.)

Type in the British Museum.

Hab.—New Zealand, exact locality unknown.

Remarks.—The dentition of this species is remarkable, but appears to be much the same as that of *R. pulchra*, MacFarland, from California. Cheeseman's *Doris rubicunda* seems also to be a *Rostanga*, and is perhaps identical with this species, in which case Abraham's name has priority. The type specimen does not look as if it had ever been scarlet, but Cheeseman's statement that *D. rubicunda* has sometimes a darker line down the centre of the back makes the identification probable, though it is curious that he does not describe the remarkable features of the radula more fully. MacFarland states that *R. pulchra* loses its scarlet in alcohol ; but, though it is nearly allied to this species, the two are probably distinct specifically. Among other points of difference, it has only 8–11 denticles on the first lateral tooth, whereas *R. muscula* has about 30. The latter seems to have no regular labial armature, but it is possible that the cuticle of the type specimen has decayed and the plate become decomposed. (Eliot.)

2. Rostanga rubicunda, Cheeseman, 1881. Plate 37, fig. 7.

Doris rubicunda, Chsm., T.N.Z.I., xiii, 1880 (1881), 222. *Rostanga rubicunda*, Chsm. : Eliot, P. Mal. S., vii, 1907, 328, 340.

Body oblong, blunt at both ends, sides nearly parallel, back elevated. *Mantle* not much larger than the foot, densely covered with minute, closely packed, narrow, erect tubercles. *Colour* bright scarlet, sometimes with a darker line down the centre, and with a few scattered blackish specks. *Rhinophores* clavate, short, stout, completely retractile ; lower part cylindrical, whitish ; central part much broader, furnished with about 12 broad laminæ that run obliquely upwards ; apex a small projecting flat-topped style. The tubercles round the base of the rhinophores are rather larger than elsewhere, and of a paler colour. *Branchiæ* completely retractile, 8 in number, small, erect, oblong, bipinnate. *Oral tentacles* free, narrow-linear. *Head* rounded, fleshy. *Foot* the same colour as the mantle or slightly darker, obtuse, and slightly notched in front, behind pointed and extending beyond the mantle when the animal is crawling. (Cheeseman.)

Length, 8–25 mm.

Odontophore broad, of very numerous rows of teeth, central tooth wanting, laterals about 50 on each side, those nearest the centre short and hooked, those on the outside much longer and more slender, strongly arched. (Cheeseman.)

Hab.—Abundant in Auckland Harbour and elsewhere on the coast (Cheeseman).

Remarks.—The species belongs to the same section of the genus (*Doris*) as the British *D. coccinea*, Forbes, to which it comes very near indeed, principally differing in the fewer bipinnate branchiæ. (Cheeseman.)

Genus 3. Alloiodoris, Bergh, 1904.

Alloiodoris, Bergh, Semper's Reise Philipp., Malac. Unters., vi, 1904, 41, fig. Type: *A. marmorata*, Bergh.

Body depressed, the back entirely covered with small tubercles; tentacles digitiform. Teeth of radula denticulate. *The hermaphrodite gland does not form a layer over the liver as usual in Dorids, but is a separate mass.* Verge terminating in a sharply defined tip.

No species should be referred to this genus on account of merely external characters. (Eliot.)

1. Alloiodoris lanuginata, Abraham, 1877. Plate 23, figs. 24, *a–d*.

Doris lanuginata, Abrah., P.Z.S., 1877, 205, 255, pl. 29, f. 15–17; M.N.Z.M., 127. *Alloiodoris lanuginata*, Abrah.: Eliot, P. Mal. S., vii, 1907, 328, 333, pl. 28, f. 1, 2. ? *A. marmorata*, Bergh, Semper's Reise Philipp., Malac. Unters., vi, 1904, 42; Basedow and Hedley, T.R.S. S.Aust., xxix, 1905, 152.

Body ovate, rather convex; consistency firm, but soft and fleshy. *Mantle* large, expanded all round, with a thick, wavy, irregular, crenate border; it is entirely covered with small tubercles, which extend to the pockets of the rhinophores and branchiæ, but are not specially large there. The tubercles are about $\frac{3}{4}$ mm. high, and stiffened by spicules, 4 of which usually project from the tip. The tubercles are not tapering, but either of uniform diameter or larger at the top. Under the microscope it can be seen that their sides bear minute projections. They are all whitish, the dark colour of the spots residing entirely in the level dorsal surface. *Colour* of dorsal surface a dirty red, with numerous white tubercles and about 25 scattered brownish spots. There are also a few spots on the under-side of the mantle, near the junction with the foot. Spirit specimens are greyish-brown or greenish-grey with blackish mottlings. The openings of the *rhinophores* form gently swelling hillocks, but are not protected by raised sheaths. The large rhinophores are yellowish with darker mottlings, and bear at least 30 deep perfoliations. The branchial pocket has a slightly raised crenulate rim. The *branchiæ*, which are deeply retracted (in spirit), are tri- and in places quadri-pinnate. There is 1 separate plume in front, and at the sides two groups of 2 plumes each, so that the branchiæ can be counted as 5 or 9 according as these groups are regarded as 2 plumes or a bifid plume. They are greenish with darker mottlings. The *oral tentacles* as preserved are long and flat, furrowed on the upper surface, and almost auriculate. The *foot* is very large, being nearly

as long and wide as the body; in front it is grooved, and the thin upper lamina is divided by a median notch.

Length. 33 mm.; breadth, 23 mm. (type). Length. 50 mm.; breadth, 33 mm.; height, 16 mm. (Cook Strait specimen).

On the *labial cuticle* is an armature, which, though large enough to be seen by the naked eye, is curiously shadowy, being not a compact plate, but a loose collection of rods, almost transparent in some places, thicker in others. But, though so unsubstantial, it is fairly definite in outline, consisting of 2 plates prolonged into tail-like appendages. The elements are longish rods, often wavy and transversely striated, sometimes, but not consistently, hooked at the tip.

The *radula* consists of 26 rows, containing 40–45 teeth on either side of the rhachis. There is no rhachidian tooth, but the first laterals project into the rhachis and almost meet. They have a few denticles on the outside, and on the inside a jagged prominence bearing 1 to 3 denticles. The second tooth has a small prominence near the base on the inner side and denticles on the outer side. The succeeding teeth increase rapidly in size until they assume the normal form—this is short, stout, and strongly hamate; on the outer side of each tooth is a ridge terminating above in a rather blunt point; in the first 10–15 teeth this ridge bears several (generally about 6) very irregular denticles; after the fifteenth tooth these denticles disappear, and only the point remains as a single denticle. It is found in all the teeth except the last three, which are thin and irregular in shape, but not serrulate.

The *hermaphrodite gland* does not form a layer over the liver as usual in Dorids, but is a separate yellowish mass, about 15 mm. long and 10 mm. broad. (Eliot.)

Sir C. Eliot gives a full account of the internal anatomy in his paper in P. Mal. S., vii.

Type in the British Museum.

Hab.—Takapuna; Cook Strait (H. S.).

Remarks.—*A. marmorata*, Bergh, is perhaps a distinct species, and Basedow and Hedley's *A. marmorata* differs in coloration and in the radula from *A. marmorata*, Bergh, and *A. lanuginata*, Abrah. (Eliot.)

Genus 4. Gargamella, Bergh, 1894.

Gargamella, Bergh, Bull. Mus. Comp. Zool. Harvard, xxv, 1894, 175. Type: *G. immaculata*, Bergh.

Body somewhat depressed, with nearly the whole of the notum sericeous in appearance; tentacles digitiform; branchial plumes tripinnate; foot bilabiate anteriorly; upper lip with a median fissure.

There is no labial armature. Radula without a central tooth, the lateral teeth multidentate, the denticles hooked. Prostata large; male organ armed with hard orbicular discs with a central hook. Vestibular glands are present.

The genus is recorded from the south-west Atlantic.

1. Gargamella novozealandica, Eliot, 1907.

Gargamella novozealandica, Eliot, P. Mal. S., vii, Sept. 1907, 329, 341.

Dorsal surface bluish-grey and covered with minute elongate soft tubercles, the texture being villous rather than warty or granulate. Under the microscope a minute brown reticulation can be seen between the tubercles. The *rhinophore-openings* lie in little hillocks, but are not protected by sheaths. The *branchiæ* are 10 in number, compressed, and pyramidal in shape; they seem to be pinnate, and in places bipinnate. The margin of the branchial pocket is not raised. The *integuments*, and especially the tubercles, are full of spicula, straight or slightly undulated, with a granulated surface; they project from the tips of the tubercles. The *oral tentacles* are small, linear, but distinct. The anterior margin of the *foot* is deeply grooved and expanded into ample flaps, as in *Kentrodoris*. (Eliot.)

Length, about 16 mm.; breadth, 7 mm.

Dark pigment was found on the labial cuticle, but no armature.

The *radula* is small, the maximum formula being $18 \times 20 + 0 + 20$, and most of the rows are smaller. The teeth are simply hamate, with long bases. The innermost are low, and have on the inner side a slight projection, hardly amounting to a denticle. The teeth increase in size up to the middle of the row, and the two or three outermost are small and thin.

The *genitalia* are small and hardened, but it was ascertained that what seems to be the vas deferens was armed with transparent discs with central spots and spines exactly like those of *G. immaculata* figured by Bergh. (Eliot.)

Hab.—Auckland Harbour.

Remark.—The specimen is probably immature, but seems referable to *Gargamella*, which is distinguished from *Thordisa* only by possessing an armature on the genitalia, and is perhaps merely a subgenus. (Eliot.)

Genus 5. Atagema, Gray, 1850.

Atagema, Gray, Fig. Moll. Anim., iv, 1850, 104, pl. 64, f. 11. Type: *Doris carinata*, Q. & G. *Atagema*, Benham, T.N.Z.I., xxxvii, 318.

Body oval, convex; back with a median keel, granulated, and a widish mantle-flap. Branchiæ tri- or quadri-pinnate. Tentacles small; foot rather stout. There is no labial armature. The radula has a narrow naked rhachis and numerous hamate teeth. Genitalia unarmed.

Apparently the only peculiarity about the animal is the dorsal keel, and it must for the present remain doubtful whether Gray was justified in founding a new genus on this character alone. (Bergh.)

The genus is precinctive to New Zealand, and the type is the only species known.

1. Atagema carinata, Quoy and Gaimard, 1832. Plate 23, figs. 18, 18*a*.

Doris carinata, Q. & G., Voy. Astrol., ii, 1832, 254, pl. 16, f. 10–14; Dieff. N.Z., 244; C.M.M., 53; Abraham, P.Z.S., 1877, 211; Chenu, Man. Conch., i, 405, f. 3052; M.N.Z.M., 128. *Atagema carinata*, Q. & G., Ad. G.R.M., ii, 60, pl. 64, f. 1; Crit. List, 38; Bergh, in Semper's Reise Philipp., Malac. Unters., vi, 39, pl. 3, f. 8–11; Benham, T.N.Z.I., xxxvii, 319, pl. 18; Eliot, P. Mal. S., vii, 328.

Body oval, with a somewhat arched back, which is finely shagreened; consistency leathery. *Colour* of the living animal pure-white, turning to yellowish-white in alcohol. *Mantle-edge* broad and the foot projecting all round. The back carries a great median keel, which commences anteriorly between the rhinophores. It is at first somewhat low and narrow, then becomes thicker, and behind the middle of its extent becomes elevated into a blunt point; thence it continues as a much narrower ridge to the gills. The projecting *rhinophore-sheath* has a circular aperture. The club of the retracted *rhinophore* is closely foliated, and terminates in a small papilla. The branchial cone consists of 4 to 5 converging lappets with rounded ends. The deeply sunk *gill* is formed of 5 or 6 tripinnate members, of which the two anterior are the larger. The relatively thin *anal papilla* is curved forward, and subcentral in position. The retracted *tentacle* is short, finger-shaped, with a groove on the under-side. The *foot* stout and broad, rounded in front, with a marginal furrow; tail relatively short.

Length, 25 mm.; breadth, 14 mm.; height, 9 mm. (figure of type). Length, 8–9 cm.; breadth, 6–7 cm.; height, 3·3 cm. (specimens from Dusky Sound).

Type in the Mus. Hist. Nat., Paris.

Hab.—Firth of Thames, type (Quoy and Gaimard); Dusky Sound (R. Henry).

Genus 6. Chromodoris, Alder and Hancock, 1855.

Chromodoris, A. & H., Trans. Zool. Soc., v, 1855, 123; Monogr. Brit. Nudibr. Moll., pt. 7, 1855, p. xvii. Type: *Doris magnifica*, Q. & G. *Glossodoris*, *Actinodoris*, *Pterodoris*, Ehrenberg, 1831. *Goniobranchus*, Pease, 1866. *Thorunna*, Bergh, 1878.

Form generally high, narrow, and limaciform, the mantle being somewhat small at the sides, but expanding into a fairly ample frontal and caudal veil. The coloration is brilliant. The foot usually projects behind the mantle. The branchiæ are simply pinnate, but are sometimes bifid, and vary considerably in their arrangement. The tentacles are retractile. The labial disc has a strong armature of minute hooks. The rhachis of the radula is either naked or bears thickenings, very rarely true teeth. The laterals are numerous and hamate: the first is denticulate on both sides, those which succeed it on the external sides only, the outermost at the extremity only.

The genus is chiefly found in warm seas, and is most abundant in the tropics; it is specially characteristic of the tropical Indo-Pacific.

It occurs in the Mediterranean and Cape Verde Islands. In the Pacific it is recorded from as far north as Japan, and on the American coast from Puget Sound and Monterey ; in the south from New Zealand, Tasmania, and Juan Fernandez, also from South Africa.

Over a hundred species have been described. They are common on coral reefs and in pools filled with seaweed. Their brilliant coloration, which is often dazzingly gorgeous in the living animal, does not appear to in any way harmonize with their environment. On the other hand, some of the most striking species are commonly found under stones, where their hues can be neither "protective" nor "warning." (Eliot.)

KEY TO SPECIES.

A. Colour of dorsum pink or purple, with a central row of oblong orange spots, occasionally a few lateral ones .. *amœna.*
B. Colour of dorsum white, with an orange line within the mantle-margin, which, however, is soon lost in spirit specimens .. .. *aureo-marginata.*
C. Colour of dorsum white, with 3 rows of roundish orange specks, which become milk-white in alcohol .. .. *atopa.*

1. Chromodoris amœna, Cheeseman, 1886. Plate 37, fig. 5.

Chromodoris amœna, Chsm., T.N.Z.I., xviii, 1885 (1886), 137 ; Eliot, P. Mal. S., vii, 1907, 329, 345. *C. figurata*, Bergh, Semper's Reise Philipp., Malac. Unters., vi, pt. 2, 1905, 71.

Body linear-oblong, rounded in front, pointed behind, back slightly convex. *Mantle* smaller than the foot, quite smooth and even. *Colour* of dorsal surface pale-pinkish or purplish-lilac, with a central row of large bright-orange oblong spots, and occasionally a few lateral ones, margin pale-creamy or yellowish-white. *Rhinophores* clavate, completely retractile within slightly raised sheaths ; upper part arched backwards, with 20 to 25 laminæ. *Branchiæ* completely retractile, varying from 8 to 10 in number, connected at the base, small, erect, linear, simply pinnate, but sometimes bipinnate, being divided into 2–4 plumes at the tip. Rhinophores and branchiæ are a bright-magenta colour. *Oral tentacles* free, small, conical. *Foot* paler than the mantle, the sides and extremity with an irregular double row of roundish bright-orange spots, considerably longer than the mantle ; sole pale flesh-colour. Ova deposited in a spiral coil of 4 turns.

Length 40–50 mm. Length, 23 mm. ; breadth, 10·5 mm. ; height, 10 mm. (spirit specimen).

Buccal mass very large. Labial armature yellowish-green, and consisting of rods somewhat bent or curved at the tip, which in some parts of the armature is bifid, in others entire.

Radula consisting of 65 to 90 rows, with 10 to 120 teeth on either side of the rhachis. The latter bears a median tooth with a long base and a low cusp, which is not denticulate, though of somewhat irregular outline. The first lateral is of the shape usual in the genus, and is denticulate on both sides, bearing on the inner side about 4 denticles.

The other laterals are denticulate only on the outer side, the number of denticles being at least 6. Near the end of the rows the main cusp diminishes and the first denticle increases, so that the tooth appears bifid. (Eliot.)

Hab.—Whangaroa Harbour, on rocks, type (Captain Farquhar); between Mahia and East Cape, by trawl (Professor Benham).

2. Chromodoris aureo-marginata, Cheeseman, 1881. Plate 37, fig. 3.

Chromodoris aureo-marginata, Chsm., T.N.Z.I., xiii, 1880 (1881), 223; Eliot, P. Mal. S., vii, 229, 346.

Body linear-oblong, much depressed, expanded and rounded in front, then contracted, and gradually tapering to a point behind. *Colour* pellucid white, with a narrow orange line within the mantle-margin on both sides. *Mantle* quite smooth and even, fairly wide at the sides and amply expanded over the head; sometimes there are traces of small low tubercles on the back; it is abbreviated posteriorly, and not nearly concealing the foot, sometimes deeply notched on the right side; margins thin, even. *Rhinophores* rather long, linear, tapering a little upwards, with about 20 laminæ, retractile within simple-edged and somewhat raised pockets. *Branchial plumes* 7 to 10, simply pinnate, erect or incurved at the tips, retractile within a common cavity. *Foot* much longer than the mantle, rather narrow, pointed behind, very thin and flexible, with a simple groove in front. On either side of the mouth is a knob-like *tentacle*.

Length 13–38 mm. Length, 12·5 mm.; breadth, 5·5 mm. (a small specimen, preserved in alcohol).

The labial armature is rather faint. It is an imperfect ring, composed of close-set short mace-like rods, swollen and bent at the tips. The *radula* consists of 50 rows, three of which are imperfectly developed, containing about 45 teeth on either side of the rhachis, which bears inconspicuous thickenings. The first lateral is broad, and appears trifid, but the prominence on the inner side bears 2–3 denticles. The second lateral is also broad, but lacks this prominence on the inner side. Apart from its greater breadth, it has the same shape as the other teeth—namely, 2 large prongs at the apex, and below them 3–6 denticles, which diminish in size downwards. The outermost teeth bear about 4 denticles on the tip. (Eliot.)

Hab.—Auckland Harbour and Waiwera (Cheeseman); Narrow Neck Reef, Devonport (H. S.); Akaroa Harbour (H. S.).

Remarks.—This form is nearly allied to *C. marginata* (Pease), and perhaps merely a variety of it. The coloration is very similar and the radula is rather narrow in both species: $50 \times 45 + 1 + 45$ in *C. aureo-marginata*, and $54 \times 35 + 1 + 35$ in *C. marginata*, examined by Bergh. But the similarity in coloration is not complete, and there is a difference in the shape of the teeth: in *C. marginata* Bergh found them simply

hamate and denticulate, but in this species the upper denticles are strongly developed, and the teeth appear bifid, as in *C. hilaris* and *C. pantherina*. (Eliot.)

3. Chromodoris atopa, Bergh, 1905.

Chromodoris atopa, Bergh, Semper's Reise Philipp., Malac. Unters., vi, 2, 1904 (1905), 73, pl. 5, f. 20–25.

Form as usual in the genus. *Colour* whitish, back with 3 longitudinal rows of roundish milk-white specks, which are orange in the living animal; up to 1·5 mm. in diameter; there are 3 specks in the middle row, 5 in each lateral row, and on the high sides of the body are about 5 longitudinal rows, but only the specks of the upper rows attain the same size as those on the back, the others are smaller, the lowest mostly of yellow colour. The rhinophores and branchiæ are also yellow. *Rhinophores* and skin of back without spicules. *Branchiæ* 8, the anal papilla 1 mm. high. Under-side of mantle-flap posteriorly with about a dozen small swellings. *Tail* extended beyond the body.

Length, 28 mm.; breadth, 15 mm.; height, 13 mm. (type specimen, in alcohol).

Labial armature well developed. *Radula* consisting of 120 rows, each row containing up to 140 teeth. Rhachis narrow, with small plates. Inner lateral teeth with 4–6 fine denticles on the outer side; the denticles diminishing in number, and then disappearing on approaching the margins. Details of the other internal organs are to be found in Dr. Bergh's paper.

Hab.—One specimen, obtained by trawl between Kaipara and New Plymouth (Professor Benham).

Remarks.—This species resembles externally *C. albonotata*, Bergh, from the Society Islands, but differs considerably in the buccal mass, labial armature, and radula. (Bergh.)

Genus 7. Aphelodoris, Bergh, 1879.

Aphelodoris, Bergh, Malak. Blätter (n.f.), i, 1879, 107. Type: *A. antillensis*, Bergh.

Form of body somewhat resembling *Chromodoris*, the mantle with frontal and caudal veil, but very narrow at the sides. Foot narrow, rounded in front, with the sides very low. Pockets of the rhinophores with slightly raised margin, the rhinophores as usual. Tentacles short, truncated, grooved on the under-side. The retractile branchiæ are not less than 5 in number, usually tripinnate. Dorsal surface smooth. Labial cuticle and genitalia without armature. Teeth of radula hamate.

Only few species are known.

Distribution.—Antilles, Pacific, New Zealand, Tasmania, and South Africa.

KEY TO SPECIES.

A. Dorsum whitish mottled with brown, or entirely brown; branchiæ 5–6, contracted, tripinnate .. .. *affinis.*
B. Dorsum flesh-brown, with reddish-brown spots; branchiæ 5, rarely 6, the two hindmost deeply cleft, forming an incomplete circle, bi- or tri-pinnate .. .. *Cheesemani.*
C. Dorsum purplish; branchiæ 6, tripinnate .. .. .. *purpurea.*

1. Aphelodoris affinis, Eliot, 1907.

Aphelodoris affinis, Eliot, P. Mal. S., vii, Sept. 1907, 343.

The *animal* is shaped somewhat as *Chromodoris:* the sides are high and the mantle-edge small. The *colour* is dirty-white with irregular mottlings of dark reddish-brown. The epidermis peels off very readily, and it is possible that the brown mottlings may have been much more extensive, or even that the dorsal surface may have been wholly brown. It is quite smooth, and presents no trace of warts or granulations. The *foot* is large, and the anterior margin is not grooved. The *oral tentacles* are white, large, flat, and distinctly grooved. The *rhinophores* are purplish-brown, and provided with sheaths 1·5 mm. high. The rim of the branchial pocket is flattened as preserved, but was probably raised in life. The *branchiæ* are purplish-brown, but the outside of the stem is whitish; they are tripinnate, much contracted, and apparently consist of 5 or 6 plumes, the division in one place not being clear. (Eliot.)

Length, 14 mm.; breadth, 8 mm.; height, 8 mm.

The labial cuticle is darker in some places than in others, but presents nothing that can be called a labial armature. The formula of the *radula* is about $23 \times 60 + 0 + 60$. The innermost teeth have long bases and lower hooks than the rest. The teeth increase in size up to the middle of the half-row, where they are large, simply hamate, and rather erect. Towards the end of the half-row they decrease in size, and have low strongly bent irregular hooks, but are not denticulate. No spines or other armature could be found in the genitalia. (Eliot.)

Some other internal organs are described by Sir Charles Eliot.

Hab.—Great Barrier Island, one specimen (C. Cooper).

2. Aphelodoris Cheesemani, Eliot, 1907. Plate 37, fig. 4.

Aphelodoris Cheesemani, Eliot, P. Mal. S., vii, 1907, 342. *Doris luctuosa*, Cheeseman, T.N.Z.I., xiv, 1881 (1882), 213. *? Archidoris varia*, Abrah.: Basedow and Hedley, T.R.S. S.Aust., xxix, 1905, 150, pl. 5, f. 1–5.

Body oblong or linear-oblong, back moderately rounded. *Mantle* small, rather narrow and hardly concealing the sides of the foot, smooth and soft to the touch, not granulate, of a dirty flesh-brown more or less spotted or streaked with reddish-brown; occasionally dirty-white with a few reddish-brown markings; towards the sides

of the mantle the reddish-brown markings are often arranged in more or less interrupted lines. Preserved specimens show various wrinkles and swellings on the dorsal surface. The sheaths of the rhinophores are about 2·5 mm. high, plain and entire, not tuberculate or denticulate. *Rhinophores* stout, clavate, completely retractile, strongly laminate, laminæ over 20 in number; they are blotched with dark purple and greenish-yellow; the tips of the sheaths are usually greenish-yellow. The branchial pocket is surrounded by a flap (preserved specimen), which may have formed a raised border in life; it is reflexed and flattened. Near the pocket are some lumps, but these, too, may perhaps be due to distortion. The *branchiæ* number 5, rarely 6, forming an incomplete circle round the tubular anus, bipinnate or tripinnate, rounded at the apex, flatly spreading; colour dark-purplish, sometimes mingled with greenish-yellow; preserved specimens have the branchiæ white outside, dull dark-green inside. The two hindermost branchiæ on either side are deeply cleft, and according as they are reckoned as one bifid plume or two plumes the whole number will be 5 or 7. *Tentacles* unusually long, slender, linear, cylindrical, often protruding beyond the edge of the mantle when the animal is crawling; in preserved specimens they are thick, with a short distinct groove at the tip, and connected with the foot by a fold. *Foot* large, broad, with thick and high sides; sole uniform flesh-colour. Its anterior margin is entire and not grooved; the lateral margin ample; the tail short. Preserved animals have the mantle-edge rather narrow, and turned upwards, so as to show the sides of the body.

Length, 25–50 mm. Length, 33·5 mm.; breadth, 16 mm.; height, 15 mm. (spirit specimen).

The labial cuticle shows a white granulation here and there, but no armature. The *radula* consists of 36 rows, of which three or four in front were short and broken. The rest contain 50–60 hamate teeth on either side of the naked rhachis. The innermost teeth are smaller, with long bases and low hooks. The hook of the first lateral is often flat and irregularly shaped, but no distinct denticulation was seen. The teeth increase in size up to nearly the end of the row; the last 3 or 4 are lower, but not denticulate and not much degraded. (Eliot.)

Further anatomical details are to be found in Sir Charles Eliot's paper.

Hab.—Auckland Harbour, on rocky ground (Cheeseman).

Remarks.—The specific name *luctuosa* is preoccupied in the genus by Bergh, 1905.

It is possible that this may be the animal described and figured by Basedow and Hedley as *Archidoris varia*, which has a somewhat similar coloration, a smooth back, grooved tentacles, elevated rhinophore-sheaths, and a similar radula ($23 \times 70 + 0 + 70$). The shape, however, seems to be different. (Eliot.)

3. Aphelodoris (?) purpurea, Bergh. 1905.

Aphelodoris (?) *purpurea*, Bergh, Semper's Reise Philipp., Malac. Unters., vi, 2, 1904 (1905), 77.

The only specimen, preserved in alcohol, was soft and much bent; its form most likely oval, somewhat depressed, back flat, mantle-edge moderately broad. *Colour* of the back purplish; the clubs of the rhinophores reddish-yellow; branchiæ on the outer side of the same colour, inner side reddish-brown; under-side yellowish. The pockets of the *rhinophores* are round. The round branchial opening 5 mm. wide, with raised margin. *Branchiæ* 6, tripinnate; the anal papilla posterior, and not much raised. *Tentacles* lappet-shaped, with a longitudinal groove of 1·5 mm. length. *Foot* rounded anteriorly. *Tail* short. Mantle and lamellæ of the rhinophores without spicules. (Bergh.)

Length, 22 mm.; breadth, 15 mm.; height, 10 mm.

Dr. Bergh supplies some information on the internal organs, but the radula was not examined.

Hab.—Between Kaipara and New Plymouth, by trawl (Professor Benham).

Remarks.—The fragmentary investigation of the animal, especially the omission of an examination of the radula, leaves the generic position of the animal doubtful. It resembled somewhat the *Chromodoridæ*, and belongs perhaps to the genus *Aphelodoris*. (Bergh.)

Fam. DORIOPSIDÆ.

Doridopsidæ.

The members of this family are simulating the true *Doridida*, but may be recognised by the poriform mouth and the very small adherent oral tentacles. The form is mostly plump, not elongated, the dorsal surface smooth or tuberculate. Mantle-edge rather broad, wavy, covering the head and sometimes the tail. Pockets of the rhinophores mostly with a smooth margin, the rhinophores completely retractile, usually with 25–35 lamellæ. Branchiæ arranged in a circle round the anus, situated on the dorsal surface above the mantle-border, their number varying from 4 to 8, tri- or quadri-pinnate. Jaw and radula are wanting, the pharynx being suctorial. Genital pore on the right anterior side.

They inhabit mostly tropical and warmer seas.

Genus 1. Doriopsis, Pease, 1860.

Doriopsis, Pease, P.Z.S., 1860, 32. Type: *Doris limbata*, Cuvier. *Doridopsis*, Alder and Hancock, 1864. *Haustellodoris*, Pease, 1871. *Rhacodoris*, Mörch, 1863. *Hexabranchus*, Gray; not of Ehrenberg. *Dendrodoris*, Ehrenberg.

The external characters are very similar to *Doris*, but of a softer consistency and with an undulating mantle-edge; the mouth is a fine pore. The buccal ganglia at the posterior end of the pharyngeal bulb in front of the salivary glands. The spawn is ribbon-shaped.

KEY TO SPECIES.

A. Colour yellow; mantle with well-developed small tubercles; branchiæ 5 .. .. *citrina.*
B. Colour light brown, with large brownish-black specks; mantle with rows of large conical tubercles; branchiæ 6 .. .. *mammosa.*

1. Doriopsis citrina, Cheeseman, 1881. Plate 36, fig. 5.

Doridopsis citrina, Chsm., T.N.Z.I., xiii, 1880 (1881), 223; Eliot, P. Mal. S., vii, 329, 348.

Body elliptic-oblong, a little depressed, equally rounded at both ends. *Mantle* very large, margin thin and almost translucent, wavy; back covered with numerous well-developed tubercles of rather irregular shape and size, and sometimes confluent; near the margin the tubercles are smaller and the intervals between them larger; under-surface smooth. *Colour* usually a pale lemon-yellow, but varying from nearly white to dark orange, always more or less freckled with minute superficial opaque-white specks. The rims of the rhinophorial and branchial pockets are slightly raised, thin, and not tuberculate. *Rhinophores* clavate, upper two-thirds strongly laminated, laminæ 19–20, retractile. *Branchiæ* 5, large, ramose, tripinnate, set round the anus in a circle that is interrupted behind, the two posterior the largest and the most branched, the whole retractile. The *mantle-margin* is fairly ample, and in places shows spicules arranged in a reticulate pattern, but the integuments are thick and not very transparent. The spicules are of various sizes and shapes, such as straight and smooth; straight with a projection on one side, V-shaped and Y-shaped. *Foot* oblong, rounded in front and behind, margin thin, even. In some specimens, but not in all, a groove can be seen on its anterior margin.

Length, 50–75 mm. Length, 24 mm.; breadth, 18 mm.; height, 7·5 mm. (spirit specimen).

The anatomy of the animal is described by Sir Charles Eliot.

Hab.—Auckland Harbour, type (Cheeseman); Lyttelton Harbour (H. S.).

Remarks.—It is particularly abundant in the winter and spring months. It is usually found in sheltered rocky places, in tide-pools or under stones. The spawn is deposited in the form of a few-coiled spiral, and is generally seen in the months of June, July, and August. (Cheeseman.)

This form closely resembles *D. fulva*, MacFarland, from California. If they are identical, Cheeseman's name has priority. (Eliot.)

2. Doriopsis mammosa, Abraham, 1877. Plate 36, fig. 4.

Doridopsis mammosa, Abrah., P.Z.S., 1877, 266, pl. 29, f. 20, 21; Cheeseman, T.N.Z.I., xiv, 214; Eliot, P. Mal. S., vii, 329, 347.

Body broadly elliptical, the back moderately elevated. *Mantle* large, usually extending on all sides beyond the foot, margins thin

and semitransparent, much undulated. On each side of the back is a row of 3 or 4 large conical or clavate erect tubercles; 2 similar ones are placed close together between the rhinophores. Numerous much smaller tubercles are scattered irregularly over the back and sides. Along the back, between the large tubercles, is a median row of 3, rarely 2, large lozenge-shaped smooth areas, free from tubercles or projections of any kind. On each side a similar row of 4 or 5 smooth areas extends from the rhinophores to the branchiæ, on the outside of the row of tubercles. These areas are *coloured* a deep velvety brown-black, and each contains a central spot and a few lateral specks or streaks of an intense greenish-blue of almost metallic lustre. The remainder of the mantle is a light brown or fawn colour, always marked, especially towards the margins, with numerous delicate whitish or greyish parallel longitudinal lines, which are more or less continuous towards the margins, but are irregular and broken at the back. The rhinophorial sheaths are thin, about 1·5 mm. high, not divided or lobed. The *rhinophores* are rather large, reflexed, and bear about 30 deep perfoliations. Branchial pocket shallow, with a few black spots on the floor. Its edge is irregularly 5-lobed, the lobes more or less tubercled. The *branchiæ* are 6, tripinnate, yellow, but the rhachides of the extreme ramifications are black. The *foot* has ample lateral margins, is pointed in front, and not grooved. Over the *mouth* are 2 rather broad flat tentacles.

Length, 5–10 cm. Length, 46 mm.; breadth, 26 mm.; height, 14 mm. (spirit specimen).

For full anatomical details see Sir Charles Eliot's paper.

Type in the British Museum.

Hab.—Mangonui to East Cape, on *Zostera* beds (Cheeseman); Cheltenham Beach, Devonport, end of December (H. S.).

Genus 2. Doriopsilla, Bergh, 1880.

Doriopsilla, Bergh, Jahrb. d. Deutsch. Malak. Gesell., vii, 1880, 316. Type: *D. areolata*, Bergh.

The dorsal surface is granulate, and harder than in *Doriopsis*, but the chief difference between the two genera is that, whereas in *Doriopsilla* the buccal ganglia beneath the alimentary tube lie immediately behind the main body of the central nervous system, in *Doriopsis* they lie at some distance behind it on a constriction of the alimentary tube, and are united to the nerve-collar by rather long connectives.

The type is from the Mediterranean; the genus has further been recorded from India and California. The Australasian species *Actinodoris australis*, Angas, has been assigned to this genus by Bergh.

1. Doriopsilla australis, Angas, 1864.

Actinodoris australis, Angas, J. de Conch. (3), xii, 1864, 49, pl. 4, f. 8.
Doriopsis australis, Angas: Bergh, Reis. Arch. Phil., ii (2), 1892, 1122; Basedow and Hedley, T.R.S. S.Aust., xxix, 145.

Animal elongate-elliptical, shining, semipellucid, uniformly olivaceous-black; branchiæ laciniate, branched; rhinophores white at the apex.

Long., 25 mm.; lat., 8 mm.

Hab.—One specimen, obtained in 30 fathoms in Tasman Bay during the trawling expedition of the s.s. "Doto," is in the Otago Museum, Dunedin. The type is from South Australia.

Tribe 3. EOLIDOMORPHA.

Cladohepatica.

Nudibranchs in which the whole of the liver is contained in the integuments and the tegumentary papillæ. The genital duct is diaulic, and the male and female orifices are contiguous. A pair of laterally placed mandibles is present. The anus is antero-lateral, except in the *Proctonotidæ*, in which it is median. The tegumentary papillæ are not ramified: they frequently contain terminal sacs (cnidosacs), which communicate on the one hand with the digestive canal, on the other hand with the exterior. The cnidosacs contain nematocysts which are invaginated while they are in the cnidosacs, but when expelled from them they are evaginated.

Fam. EOLIDIDÆ, d'Orbigny.

Æolididæ.

Body elongated, limaciform; rhinophores non-retractile. Dorsal papillæ spindle-shaped or club-shaped, each ending in an open sac of endodermic origin which communicates with the hepatic cæcum and contains nematocysts. Anus lateral. Mouth armed with horny jaws. Radula uni- or tri-serial.

Genus 1. Eolis, Cuvier, 1798.

Eolis, Cuvier, Tabl. Elément., 1798, 388. Type: *Limax papillosus*, L.
Æolidia, Cuvier, 1817.

Body ovate or linear; head with very long cylindrical buccal tentacles; rhinophores smooth, long. Dorsal papillæ compressed. The anterior angles of the foot prominent. Orifices of generative system and vent on the right side. The jaws usually with a crenate lower margin. Radula uni- or tri-serial.

Members of this genus are found in all seas, and the species are numerous.

1. Eolis gracilis, T. W. Kirk, 1883. Plate 23, fig. 19.

Æolis gracilis, Kirk, T.N.Z.I., xv, 1882 (1883), 217, figs. in text.

Body small; tail sharply pointed. *Dorsal papillæ* as long as greatest width of the body, crowded, but placed in three tolerably

distinct groups on each side of a clear broad line running from the base of the rhinophores to the tip of the tail. *Oral tentacles* subulate, rather distant, about twice as long as the greatest width of the animal. *Rhinophores* approximate, about half as long as the tentacles. *Foot* expanded, produced in front, margin thin, slightly puckered. *Colour :* Body and foot pale pink ; tentacles and papillæ bright red, prominently tipped with white.

Length, 23 mm.

Hab.—Napier, on *Ulva* (A. Hamilton).

2. Eolis leptosoma, Hutton, 1884.

Æolis leptosoma, Hutt., T.N.Z.I., xvi, 1883 (1884), 213.

Animal small, elongated, the tail rather short, pointed ; minute eyes behind the tentacles. *Rhinophores* and *oral tentacles* subulate, the latter distant at their bases. *Papillæ* as long as the breadth of the animal, crowded, in about 12 transverse rows on each side of the back. *Foot* rather expanded, the margin thin, not crisped nor produced in front. *Colour* yellowish-white, with some thin lines of reddish-yellow on the head and back ; dorsal papillæ brownish-grey, tipped and slightly margined with white.

Length, 10 mm.

Radula consisting of about 36 uniserial rows of teeth. Each tooth strongly arched, with 6 or 7 cutting-points, the central being rather larger than the others (Hutton, *t.c.*, 213, pl. 11, f. 2).

Hab.—Lyttelton Harbour, on Sertularians (Hutton).

Genus 2. ÆOLIDIELLA, Bergh, 1867.

Æolidiella, Bergh, Videnskabilige Meddelser d. Naturh. Forening, 1867, 99. Type : *A. Sommeringii*, Leuc.

Animal having the form of *Eolis*. Rhinophores simple. Teeth of radula pectiniform, emarginate at the middle. Salivary glands very large.

Æolidiella drusilla, Bergh, 1900.

Æolidiella drusilla, Bergh., Zool. Jahrb. Syst., xiii, 3, 1900, 233, pl. 20, f. 41–46.

Form of animal somewhat depressed, but little narrowed in front and behind. *Head* short and rather broad ; *tentacles* with a thick base. The white *rhinophores* between the first anterior rows of the dorsal papillæ cylindrical and truncated. Only the anterior fourth of the back without *papillæ* in the middle, the remainder crowded with them ; they are arranged in about 25 rows, most of which are obliquely directed forward and outward. The anterior rows have 3–4, 7–8, 11–12 papillæ, the sixth row 21, and the number does not increase much ; the last rows with a few papillæ only. They are slightly bent, cylindrical, and pointed at the end. *Anal papilla* situated between the fifth and sixth row of papillæ, and a little in front is the

renal pore. *Back* rounded towards the low sides of the body; *genital opening* on the right side. Anterior margin of *foot* arched, strongly grooved; edge of the foot not narrow; tail short. *Colour* whitish; papillæ grey, tips white.

Length, 2·8 cm.; breadth, 1·8 cm.; height without papillæ, 0·7 cm.

Jaws high and narrow, cutting-edge smooth, finely striated. *Radula* with about 20 rows of teeth, which are arched, with a strong median and 23–35 smaller sharp denticles on either side.

Details on the other internal organs are to be found in Dr. Bergh's publication.

Hab.—French Pass, one specimen (Professor Schauinsland).

2. Æolidiella faustina, Bergh, 1900.

Æolidiella faustina, Bergh., Zool. Jahrb., Syst., xiii, 3, 1900, 235, pl. 20, f. 39, 40.

Form of animal as usual in the genus. *Papillæ* covering nearly the whole of the dorsal surface; anteriorly their arrangement produces 2 horseshoe-shaped figures; behind these 4 there are about 10 somewhat oblique rows, each row containing about 6–8 papillæ; they are cylindro-conic and close together. Anal papilla behind the sixth row. *Colour* dirty light-yellowish.

Length, 15 mm.; breadth, 3·5 mm.

Cutting-edge of *jaws* finely striated. *Radula* with 25 rows of teeth, which are semicircular, notched at the middle of the posterior margin, with a short stout median denticle, and about 35 long slender denticles on each side.

The other internal organs resembling those of the foregoing species.

Hab.—French Pass, one specimen (Professor Schauinsland).

Genus 3. Facelina, Alder and Hancock, 1855.

Facelina, A. & H., Monogr. Brit. Nudibr. Moll., 1855. Type: *Eolida coronata*, Forbes. *Acanthopsole*, Trinchese, 1874.

Body rather slender. Rhinophores perfoliated; oral tentacles long. Dorsal papillæ linear or fusiform, clustered. Foot narrow, with the anterior angles acute and much produced. Radula uniserial, the posterior margin of teeth pectinated.

1. Facelina sp.

Facelina sp., Eliot, P. Mal. S., vii, 1907, 331.

Animal long and narrow, with a tapering tail and curved tentacular projections on the anterior margin of the foot. *Colour* uniform dull olive, as preserved. *Oral tentacles* very large and stout. *Rhinophores* stout, deeply ringed. *Cerata* sparse and small; many have been lost, but they seem to have been set in four groups. *Radula:* A single series of 18 teeth of the usual horseshoe shape, with a long prominent central cusp and 4 very distinct denticles on either side of it. *Jaws* decayed, but apparently bearing a single row of irregular

and not very clear denticles. *Penis* armed with numerous small prominences or spines. (Eliot.)

Length, 13 mm.; breadth, 3 mm.

Hab.—Dunedin Harbour, one specimen (H. S.).

Remarks.—This seems to be a typical *Facelina*. The dentition agrees with *F. Stearnsi*, recorded from California, but without more data as to the colour and appearance of the living animal identification is impossible. (Eliot.)

Genus 4. Eolidia, Cuvier, 1817.

Eolidia, Cuvier, "Règne Animal," ii, 1817, 393. Type: *Limax papillosus*, L.

Rhinophores simple; cerata compressed. Radula uniserial, the teeth arched and the posterior margin regularly pectinated.

1. Eolidia longicauda, Quoy and Gaimard, 1832. Plate 23, fig. 20.

Eolidia longicauda, Q. & G., Voy. Astrol., ii, 1832, 288, pl. 21, f. 19, 20; Gray, Dieff. N.Z., 119. *Æolis* (*Phidiana*) *longicauda*, Q. & G., Crit. List, 38. *Phidiana longicauda*, Q. & G., M.N.Z.M., 129; T.N.Z.I., xiii, 203. *Facelina longicauda*, Q. & G., Index, 68.

Body elongate, thin, the foot spreading beyond the body on either side, it is wavy, pointed, and ending in a tail. *Colour* white, diaphanous. *Back* with a slight groove, and in front it is separated from the mouth by a transverse groove. The 4 *tentacles* are long, fusiform, pointed. The upper tentacles are longer, inserted on the top of the head, and approximate at their bases; lower tentacles distant, a little above the mouth. There are no *eyes*. The *cerata* are arranged in several lateral rows upon the back. They are elongated, subcompressed. *Anal orifice* on the back, having sometimes the appearance of a rosette. *Genital orifice* on the right anterior side. Top of the head reddish-yellow; dorsal surface and cerata brownish; rest of the body white. (Q. & G.)

Length of largest specimens, about 55 mm.; length of tail, not less than 13½ mm.

Type in the Mus. Hist. Nat., Paris.

Hab.—Cook Strait, on *Fucus* (Q. & G.).

Remarks.—The generic position of this species is uncertain.

Genus 5. Hervia, Bergh, 1871.

Hervia, Bergh., Naturh. Foren-Vidsk. Meddel., 1871, 183; Bergh., Beiträge zur Kenntniss der Æolidiaden, ii, 1875. Type: *H. modesta*, Bergh. *Hervia*, Vayssière, Ann. Mus. Hist. Nat. de Marseilles, Zoologie, iii, 1888, 51. *Rizzolia*, Trinchese, 1877.

Animal elongated and slender, the back well rounded; foot a little shorter than the body, with anterior tentaculiform processes. Labial tentacles long, cylindro-conic; rhinophores smooth, a little shorter and stouter than the labial tentacles, distally attenuated. The tegumentary papillæ are disposed in indistinct groups on the

sides of the back; they are more or less fusiform and circular in transverse section; each contains a cnidocystic sac with numerous nematocysts. Generative orifices on the right side, a little in front of the first group of papillæ; the anus on the same side, beneath the second group of cirri. The cutting-edge of the jaws denticulate. Radula uniserial, the teeth lanceolate, with several sharp and long denticles on each side. Nervous system composed of 4 ganglia in its central part, 2 cerebral and 2 pedal. Eyes sessile. Otocysts containing numerous otoliths.

Distribution.—North Atlantic, Mediterranean, Ceylon, Amboina, East Africa, New Zealand.

1. Hervia (?) Corfei, Hutton, 1881.

Montagua Corfei, Hutt., T.N.Z.I., xiii, 1880 (1881), 203. *Cratena Corfei*, Hutt., Index, 68. *Hervia (?) Corfei*, Hutt.: Eliot, P. Mal. S., vii, 328.

Tentacles approximated, tapering, standing erect at some distance behind the oral tentacles; a minute eye at their outer bases. *Oral tentacles* distant, tapering, half as long again as the tentacles. *Body* prolonged posteriorly into a long tapering tail. *Branchiæ* in 4 or 5 rows on each side of the back, crowded, linear, pointed, unequal. *Foot* grooved along the centre, the margin thin; contracted anteriorly and then produced on each side into a curved tapering fold directed backward. Foot, back, tentacles, and oral tentacles translucent white; a dead-white longitudinal line down the centre of the tail. Head pale pink. Branchiæ bright red, tipped with dead-white. (Hutton.)

Length about 25 mm., of which the tail is more than one-fourth.

Hab.—Governor's Bay, Lyttelton Harbour (C. C. Corfe).

Fam. PROCTONOTIDÆ, Alder and Hancock.

Janidæ, Bergh.

This family superficially resembles the true Eolids, but offers several differences of organization. Except in *Madrella*, the radula is multiseriate; the anal papilla is situated near the end of the back in the median line. The cerata, together with the hepatic diverticula, extend in front of the rhinophores along the anterior margin. There is generally a crest between the rhinophores. Anterior tentacles atrophied; foot broad.

Genus 1. Antiopella, Hoyle, 1902.

Antiopella, Hoyle, J. of Conch., 1902, 214. Type: *Janus cristatus*, Delle Chiaje. *Janus*, Vérany, 1844, preoccupied in *Hymenoptera*, 1835. *Antiopa*, Alder and Hancock, 1855, preoccupied in *Diptera*, 1800.

Animal elongated oval: rhinophores perfoliate, united at their bases by an arched crest. Cerata cylindrical, simple, crowded,

arranged along the sides of the back, and continuous above the head. Mouth with corneous jaws. Lateral and marginal teeth of radula numerous, narrow; central tooth narrow.

Genus hitherto recorded with certainty only from North Atlantic.

1. Antiopella novozealandica, Eliot, 1907.

Antiopella novozealandica, Eliot, P. Mal. S., vii, Sept. 1907, 331.

Animal stoutly built, greyish in colour. Down the middle of the back, both before and behind the rhinophores, runs a purplish stripe which becomes dissolved into a multitude of dots posteriorly. In the middle of this stripe, just behind the rhinophore, is a lozenge-shaped light-coloured area. The *rhinophores* are grey with purplish spots, large (4 mm. high), and have between them a large crest of the same colour. Both the rhinophores and the crest are so amply and deeply perfoliate that the whole arrangement superficially resembles the branchial rosette of a Dorid. The *anal papilla* is large, prominent, medio-dorsal, and nearly terminal, with a crenulated edge.

The *cerata* are very numerous, often flattened as preserved, but apparently originally fusiform. The innermost are the largest, and as much as 6·5 mm. high. They are not set in regular rows, but in a reticulate pattern, which is generally 4–6 mm. deep transversely. Two or three lines of small cerata extend round the head in front of the rhinophores. The hepatic diverticula within the cerata are of irregular shape, and often conspicuously granulate or folliculate, but not bifid or branched. Some parts of them are much darker than others, and spotted with purple.

Below the anterior mantle-edge is a small *oral veil* bearing 2 distinct purple tentacles. The *foot* is broad, with expanded lateral margins, which are not, however, broader than the body; its anterior margin is bilobed and connected with the mouth, but not grooved or produced into tentacular processes. The *genital orifices* are rather far back, 6 mm. from the anterior end. The *tail* is very short.

Length, 14 mm.; breadth, 6 mm.; height, 4 mm.

The buccal mass is very large. The *jaws* are long, but narrow, bright yellow, but darker near the hinge and edges. There are accessory pieces near the hinges. There appears to be some denticulation on the cutting-edge, but it is not large or distinct. Possibly the jaws have been injured. The *radula* consists of 23 rows (3 undeveloped) of white transparent teeth. The maximum formula is 37+1+37. The central tooth is not conspicuous, and differs from the others only in its central position and in being smaller. The teeth are hamate, not denticulate, and increase in size outwards. Only the outermost of all is smaller. (Eliot.)

For further anatomical details see Sir Charles Eliot's paper.

Hab.—New Zealand, exact locality unknown. One specimen.

Remarks.—This species appears to have the characters of a typical *Antiopella*, except that the jaws are not distinctly and strongly denticulate. It differs from the British *A. cristata* in its colour and in the size of the rhinophores and crest, perhaps also in the jaws. (Eliot.)

Fam. FIONIDÆ, Alder and Hancock.

Body elongated; rhinophores simple, not retractile, without pockets; cerata devoid of cnidosacs, arranged as in *Eolididæ;* anus latero-dorsal. Jaws horny. Radula uniserial; teeth arched, with pectinated edge and with a median cusp which is longer than the side cusps.

Genus 1. Fiona, Hancock and Embleton, 1853.

Fiona, H. & E., A.M.N.H., xv, 1853, 10. Type: *F. nobilis*, H. & E. *Oithona*, Hancock and Embleton, 1851. *Hymenæolis*, Costa, 1866.

Body oblong-elliptical; rhinophores simple, resembling the oral tentacles. Cerata elongated, with a membranous fringe on the inner sides. Genital orifices separate. Jaws corneous, with a denticulate cutting-edge.

Distribution.—Atlantic, Indian Ocean, Pacific.

These animals are pelagic, and are usually found on *Fucus*. According to Dr. Dall, their nouriture consists of *Velella*.

1. Fiona marina, Forskal, 1775. Plate 23, fig. 21.

Limax marina, Forsk., Descript. Animal, &c., 1775, 99. *Fiona marina*, Bergh., Opistobr. Camp. "Hirondelle," 1892, 6, pl. 1 f. 7–16 (anatomy); Zool. Jahrb. Syst., xiii, 1900, 239; Basedow and Hedley, T.R.S. S.Aust., xxix, 136; Bergh, Chall. Rep., x, 9. *F. nobilis*, Ald. & Hanc., A.M.N.H., xv, 1853, 10. *F. atlantica*, Bergh., Vidensk. Meddel. f. naturhist. Foren, 1857, 273. *F. marina*, var. *pacifica*, Bergh., Nudibr. Gastr. Moll., 1879, 86. *F. pinnata*, Eschscholtz: Bergh., Kenntn. Æolidaden, 1874, 606. *Hymenæolis elegantissima*, Costa, Ann. Mus. Zool. Napoli, 1866, 64, 80. *Æolis plicata*, Hutton, T.N.Z.I., xiv, 1881 (1882), 166, pl. 6, f. 1.

Head, neck, and body white. *Branchiæ* in close transverse rows on the back, dark brown, each margined with white. *Body* not tapering behind. Margin of *foot* fringed and crumpled, except near the head, where it is simple; it is divided in front, but not produced. On the side, below the cerata, several rows of small white papillæ (?) arranged in festoons. *Rhinophores* distant, subulate, tapering, projecting outward, white. No *eyes*. *Oral tentacles* shorter, thickened at the base, tapering, projecting laterally, and curved backward; white. (Hutton.)

Length, about 20 mm.

Dentition 0+1+0. About 17 or 18 teeth on the radula, in a single series. Each tooth crescent-shaped, with a pointed tooth in the centre, and 6 denticles on each side. Jaws 2, the apices acute and denticulated, the posterior portion flattened (Hutton, T.N.Z.I., xiv, 166, pl. 6, f. F, *a*, *b*).

Hab.—Sumner, on roots of *D'Urvillæa utilis* (Hutton); New Brighton, on floating timber (H. S.); Pigeon Bay; Chatham Islands (Professor Schauinsland).

Bergh thinks the species to be circumæquatoral.

On the cell-lineage and early larval development of *F. marina:* D. B. Casteel, in Proc. Acad. Nat. Sci. Philad., lvi, 1904, 325–405, pl. 21–35.

Tribe 4. ELYSIOMORPHA.

Nudibranchia in which the liver ramifies in the integuments and extends into the dorsal papillæ. The genital duct is always triaulic, and the male and female orifices are distant. The gonad is divided into spheroidal hermaphrodite lobules. There are no mandibles, and the radula is uniserial. There is never more than 1 pair of tentacles, and these are wanting in some genera.

Fam. HERMÆIDÆ, Adams.

Body depressed; rhinophores simple, canaliculate, or wanting. Dorsal papillæ without nematocysts, linear or fusiform, and disposed in several series. Foot narrow. Teeth of radula narrow.

Genus 1. Stiliger, Ehrenberg, 1831.

Stiliger, Ehbg., "Symbolæ Physicæ," i, 1831. Type: *Calliopæa bellula*, d'Orbigny. *Calliopæa*, d'Orbigny, 1837. *Custiphorus*, Deshayes, 1864.

Body elongated. Rhinophores simple, filiform, non-retractile. Dorsal papillæ fusiform or ovoid, disposed in one or several series. Anus antero-dorsal. Foot rounded in front, angled at the sides.

Distribution.—North Atlantic, Red Sea, New Zealand.

1. Stiliger felinus, Hutton, 1882. Plate 23, fig. 22.

Calliopæa felina, Hutt., N.Z.J.S., i, 1882, 69; T.N.Z.I., xv, 1882 (1883), 133, fig. in text; *t.c.*, 118, pl. 13, f. B (dentition). *Stiliger felina*, Hutt., Index, 68. *S. felinus*, Hutt.: Eliot, P. Mal. S., vii, 328, 330.

Body elongated, the integuments very thin, translucent, head small. *Colour* dark brown to black; the dorsal surface and the inner side of the larger anterior cerata are of a deep rich purplish-brown, almost black. The outer sides of the larger cerata, the whole of the posterior cerata, and the sides of the body are lighter brown. At the tip of each of the cerata is a lighter but not very conspicuous spot. Conspicuous, however, and bright white are the anal papilla and the tips and under-sides of the rhinophores. From each rhinophore a band runs downwards; the two bands meet and form a white border across the head. The *cerata* are set in from 6 to 10 transverse rows, consisting of from 2 to 3 cerata each, but the third longitudinal line of cerata is not perfectly developed in any specimen. The inner cerata are considerably larger than the outer, and in some specimens one or two of them are markedly larger than the others. In

most specimens there is visible a large bare area down the centre of the back. The *rhinophores* are distinct, but not large; entire, not perfoliated or grooved. The white band which runs from them to the mouth appears in some specimens to be a ridge. They point outwards, right and left, and do not stand vertically. The *anal papilla* is dorsal, behind the pericardial prominence, and slightly to the left of it. The *genital opening* is just behind the rhinophores. The *foot* is fairly broad, white, truncated in front, not grooved or notched, and not produced into tentacular processes at the corners. Its margins are not expanded at the sides, and it is prolonged into a short flat tail behind the body. (Eliot.)

Length about 10 mm.; breadth, 4·5 mm.; height, 3·3 mm. (largest preserved specimen). The largest cerata are about 3·5 mm. high, with a maximum breadth of nearly 2·5 mm.

The buccal mass is small, of the shape usual in the genus, and without jaws. In the specimens dissected the *radula* was consistently composed of 5 teeth in the ascending portion, 8 in the descending, and about 10 in the sac, still retaining a spiral arrangement, though somewhat in disorder. The teeth are as usual in the *Ascoglossa:* they are rather large, colourless, spoon-shaped, indented in the back, and not denticulate in any part. (Eliot.)

For further information on the anatomy of the species see Sir Charles Eliot's paper.

Hab.—Lyttelton Harbour, type (Hutton); Te Onepoto Bay, near Lyttelton, in a tide-pool (H. S.).

Remarks.—This species is allied to the *S. bellulus* (= *S. Mariæ*) of European waters, but differs in having more cerata and a ridge-like prolongation of the pericardium visible on the back; perhaps also in the absence of a spine in the genitalia. (Eliot.)

Order 2. **PULMONATA,** Cuvier.

Euthyneura with a pallial cavity, but no ctenidium. The pallial aperture is diminished by the fusion of the mantle-border with the neck, and reduced to a comparatively small contractile orifice at its posterior extremity. The pallial cavity and shell are often reduced; the latter may be partially covered over, or internal, or even absent. There is never an operculum in the adult, except in *Amphibola*, and an operculum is only found during the development in the *Auriculidæ*, *Siphonariidæ*, and *Onchididæ*, all of which are marine forms. In the pallial cavity the interior wall of the mantle is traversed by vascular arborisations, and thus constitutes a pulmonary organ adapted for breathing air. In the *Athoracophoridæ* the pulmonary cavity is prolonged into fine respiratory canaliculi, and thus becomes a tracheal lung. It is much reduced in the *Onchididæ*. In some rare cases the pulmonary cavity may be filled with water, and then its wall may give rise to a secondary branchia which is not the equivalent of a ctenidium

(*Siphonaria*). In other cases the inferior pallial lobe, situated beneath the pulmonary orifice of the *Basommatophora*, may be transformed into a branchia (*Planorbidæ*). The auricle of the heart is usually anterior, as is the case in the most archaic Opisthobranchs, and it is only in the excessively detorted forms, such as *Testacella* and the *Onchididæ*, that the ventricle lies in front of the auricle. The kidney usually has a more or less elongated duct or ureter. In the nervous system, as a rule, all the ganglia are concentrated round the œsophagus, and are closely opposed to one another; but this is not the case in some archaic *Basommatophora*, such as *Auricula*, *Latia*. There is no longer a common genital orifice, but the hermaphrodite duct bifurcates to form a distinct oviduct of greater or less length, and the primitive hermaphrodite aperture becomes the female orifice. As a result of secondary changes, the orifices of the oviduct and verge may be approximated, a condition found in the majority of the *Stylommatophora*.

The Pulmonates never have a free larval form; if a veliger is developed, it is always contained in the egg-membranes. The majority of the *Stylommatophora* do not pass through a veliger stage, and in other forms the velum is almost always ill-developed.

The Pulmonates are for the most part aerial, but some live in fresh water, and others (but they are exceptional cases) are marine. They are distributed over the whole world, and include some 7,000 species, of which more than half are helicoid forms. Most of them enter into a resting-stage during some part of the year—in the summer in hot climates, in the winter in cold climates.

The *Pulmonata* are divided into two suborders—*Basommatophora* and *Stylommatophora*; the former are generally aquatic, the latter terrestrial.

Suborder 1. BASOMMATOPHORA.

Testaceous *Pulmonata* with an external shell. The head bears a single pair of well-developed contractile but not invaginable tentacles, at the bases of which are the eyes. The stomach, or at least a part of it, is very muscular. The male organ is at some distance from the female aperture, except in *Amphibola* and *Siphonaria*. All have an osphradium (except the *Auriculidæ*, which are terrestrial), which is situated outside the pallial cavity in those forms in which water is not admitted into the lung (*Lymnæa*, *Planorbis*, &c.). There is a veliger stage in the development, but the velum is reduced.

Fam. AURICULIDÆ, Blainville.

Terrestrial and usually maritime animals. Head ending in a snout; tentacles subcylindrical, contractile; eyes sessile at the inner sides of their bases. Mantle closed, with a thickened margin; respiratory orifice posterior, on the right side. Foot ovate, obtuse behind. The genital duct is monaulic, the verge being connected with the

hermaphrodite opening by an open or closed groove. Mouth with an upper horny jaw, and with 2 buccal lobes, united above, separate below. Radula broad and long; teeth numerous, in slightly bent cross-series; central tooth narrow, tricuspid; laterals diminishing outwards.

Shell spiral, with a horny epidermis, the internal partitions often absorbed; aperture elongate, with strong folds on the inner lip; the outer lip often dentate.

These animals usually frequent salt marshes.

Fossil they appear first in the Jurassic.

KEY TO GENERA.

A. Shell with a periumbilical keel; columella with 2 plaits .. OPHICARDELUS.
B. Shell without a keel on the umbilical area.
a. Columella with 3 plaits, the uppermost very large .. MARINULA.
aa. Columella with 2 small plaits, the lower one sometimes obsolete, situated on the lower half .. .. LEUCONIA.
aaa. Columella with 2 strong plaits, situated at the upper half .. .. CREMNOBATES.

Genus 1. OPHICARDELUS, Beck, 1837.

Ophicardelus, Beck, "Index Molluscorum," 1837, 108. Type: *Auricula australis*, Q. & G.

Shell ovato-oblong; spire elevated, subconic; aperture oval; columella with 2 plaits, the lower oblique, the upper horizontal and prolonged exteriorly, forming a periumbilical keel; outer lip simple, without teeth.

Distribution.—Australasia, New Caledonia, &c.

1. Ophicardelus australis, Quoy and Gaimard, 1832. Plate 24, fig. 1.

Auricula australis, Q. & G., Voy. Astrol., ii, 1832, 169, pl. 13, f. 34–38. *Ophicardelus australis*, Q. & G., Ad. G.R.M., pl. 82, f. 9. *Melampus* (*Ophicardelus*) *australis*, Q. & G., Crit. List, 39. *Ophicardelus australis*, Q. & G.: Hutton, J. de Conch., 1878, 42; M.N.Z.M., 34; Conch. Icon., xx, f. 34. *Tralia* (*Ophicardelus*) *australis*, Q. & G.: Crosse, J. de Conch., xlii, 320. *Melampus costellaris*, H. and A. Adams, P.Z.S., 1854, 12; C.M.M., 57; Crit. List, 39; Hutton, J. de Conch., 42. *Tralia costellaris*, Ad., M.N.Z.M., 33. *Cremnobates cornea*, Swainson, P.R.S. Tas., 1856, 43. *Melampus Stutchburyi*, Pfeiffer, P.Z.S., 1856, 393.

Shell ovate-conic, imperforate or rimate, rather solid, smooth or costate, usually with brownish spiral bands. *Sculpture* consisting of distinct growth-lines, and very often of numerous irregularly spaced and flattish axial ribs, no doubt marking periods of growth; below the suture there is a more or less distinct narrow groove. *Colour* yellowish or light brown, with one or several dark-brown spiral bands. *Epidermis* horny, thin, faintly shining. *Spire* conical, generally a little less than the height of the aperture; outlines lightly convex. *Protoconch* very small, almost always eroded. *Whorls* 9, flat, the last

large, ventricose, convex, attenuated towards the base, which is flat or somewhat excavated inside the umbilical keel. *Suture* linear, uneven. *Aperture* subvertical, narrowly ovate, angled above. *Outer lip* lightly convex, sometimes with an outer varix, smooth inside, strengthened inside by a light callus on the lower half. *Columella* vertical, with a sharply elevated horizontal plait at the junction with the parietal wall, and a second more or less oblique and not so sharp plait about the middle between the upper plait and the basal lip. *Inner lip* broadly extended between the 2 plaits, and as a thin shining glaze over the parietal wall. Some specimens show an indistinct *umbilical chink*.

Diameter, 7 mm.; height, 13·5 mm. (type). Diameter, 5·5 mm.; height, 10·5 mm. (New Zealand specimen).

Animal moderately large; tentacles fusiform, not sharply pointed, sometimes a little inflated, brown, annulated with black, eyes at their inner bases; muzzle elongated; foot oval, a little pointed, without bifurcation; colour dark brown, the sides lighter. (Q. & G.)

Dentition.—Hutton, T.N.Z.I., xvi, 212, pl. 11, f. 1.

Type in the Mus. Hist. Nat., Paris.

Hab.—North Island and the northern part of the South Island, in brackish water and mangrove swamps; common. Also Tasmania, Australia, and New Caledonia.

Remarks.—The type of *M. costellaris*, Ad., was collected in New Zealand by Strange.

Genus 2. Marinula, King, 1831.

Marinula, King, Zool. Journ., v, Sept. 1831, 344. Type: *Marinula pepita*, King.

Animal with the foot simple inferiorly, without a transverse groove.

Shell ovato-oblong, imperforate, solid, smooth; spire short, conic; aperture subovate; columella flattened, with 3 plaits, the upper one very large, obliquely descending, the lower two smaller and less oblique; outer lip posteriorly sinuated, simple, acute.

Distribution.—Pacific, South America, Australasia.

Fossil in the Eocene of Paris.

1. Marinula Filholi, Hutton, 1878. Plate 24, fig. 2.

Marinula Filholi, Hutt., J. de Conch., xxvi, 1878, 42; T.N.Z.I., x, 297; M.N.Z.M., 34.

Shell ovato-oblong, smooth, brown, with 3 columellar plaits. Fine oblique growth-lines are the only *sculpture*. *Colour* purplish-brown or fulvous, aperture light brown inside, peristome and the plaits white. *Epidermis* very thin, not shining. *Spire* short, conic, about three-quarters the height of the aperture; outlines convex. *Protoconch* globose, smooth, mostly eroded. *Whorls* 5 to 6, the last large, somewhat ventricose, the upper volutions lightly convex. *Suture*

linear, somewhat uneven. *Aperture* pyriform, channelled above, rounded below. *Outer lip* very slightly sinuate above, sharp, but rather solid, lightly convex, smooth inside. *Columella* vertical, with a lower small and an upper larger plait, both of which are nearly transverse; a third plait, very large and obliquely descending, is situated at the middle of the parietal wall. *Inner lip* extending as a thin glaze beyond the columella on the body.

Diameter, 5 mm.; height, 9 mm. (type).

Animal unknown.

Type in the Otago University Museum, Dunedin.

Hab.—Massacre Bay, type (Filhol); Auckland (Cheeseman); Bay of Islands; Chicken Islands; Mokohinau Islands; Foxton; Chatham Islands; Banks Peninsula (Iredale).

Genus 3. Leuconia, Gray, 1840.

Leuconia, Gray, "Turton's Manual," ed. 2, 227. Type: *Voluta bidentata*, Montfort.

Animal having short and compressed tentacles, with the eyes at their bases. Foot truncated in front, with a transverse anterior groove.

Shell ovate, oblong, imperforate, smooth; spire conical; aperture elongate, ovate; inner lip with 2 plaits anteriorly; outer lip smooth inside, simple, acute.

Distribution.—Seas of Europe, Antilles.

Sect. 1. Leuconopsis, Hutton, 1884.

Leuconopsis, Hutt., T.N.Z.I., xvi, 1883 (1884), 213. Type: *L. obsoleta*, Hutt.

Distinguished from the genus by having only 1 plait on the inner lip.

Distribution.—Australasia.

Key to Species.

A. Shell with 6 whorls when adult, with a very feeble columellar plait; spiral striæ distant .. .. *inermis.*

B. Shell with 4 whorls when adult, the columellar fold well pronounced; spiral striæ close .. .. *obsoleta.*

1. Leuconia inermis, Hedley, 1901. Plate 24, fig. 3.

Leuconopsis inermis, Hedley, P.L.S. N.S.W., xxv, 722, pl. 48, f. 15; Iredale, T.N.Z.I., xl, 386.

Shell ovate, solid, imperforate. *Sculpture:* The surface is usually much abraded; where it is intact fine raised hair-lines twice or thrice their own diameter apart cross the shell obliquely; a few faint and distant spiral grooves are perceptible. *Colour* dull white. Traces are present of a thin membranous yellow *epidermis*. *Spire* conical

convex, its height less than that of the aperture. *Protoconch* small, obtuse. *Whorls* 6, gradually increasing, last large, compressed below the suture, flattened at the periphery and rounded at the base. *Suture* channelled. *Aperture* auriculate, slightly oblique. *Outer lip* sinuous, neither thickened nor reflected. A small but sharp and deeply seated plication occurs on the body-whorl, anterior to the centre; immediately in front of this, and deeper still, is a second ill-developed fold. A heavy callus is spread on the body-whorl.

Diameter, 1·16 mm.; height, 3 mm. (type).

Animal unknown.

Type in the Australian Museum, Sydney.

Hab.—Takapuna (W. H. Webster). The type is from Sydney Harbour.

Remarks.—Iredale is of opinion that only one species, *L. obsoleta*, should be recognised as occurring in New Zealand, and he feels certain that the examination of a larger series from Takapuna will induce Webster to withdraw his record of *L. inermis*, Hedley.

2. Leuconia obsoleta, Hutton, 1878. Plate 24, fig. 4.

Leuconia obsoleta, Hutt., J. de Conch., xxvi, 1878, 43; T.N.Z.I., x, 1877 (1878), 297; M.N.Z.M., 34; Hedley, P.L.S. N.S.W., xxv, 723, pl. 48, f. 16; Iredale, T.N.Z.I., xl, 385.

Shell small, ovate, thin, semitransparent. *Sculpture* consisting of fine spiral striæ, close together on the base, but more distant on the upper part of the body-whorl, crossed by fine oblique growth-lines. *Colour* whitish. *Epidermis* very thin, light brown. *Spire* short, conic, about three-quarters the height of the aperture; outlines convex. *Protoconch* small, papillate. *Whorls* 4, lightly convex, the last ventricose, large, compressed below the suture; base rounded. *Suture* not much impressed. *Aperture* ovate, angled above, rounded below. *Outer lip* slightly sinuate above, straightened at the middle, thin and sharp, smooth inside. *Columella* subvertical, flat, concave below, with a distinct sharp transverse plait at the junction with the flattish parietal wall, and a small low tubercle below. *Inner lip* thin, inconspicuous.

Diameter, 1·7 mm.; height, 3·1 mm.

Dentition.—Hutton, T.N.Z.I., xvi, 213.

Type in the Otago University Museum, Dunedin.

Hab.—Auckland Harbour, under stones near high-water mark, local; type (Cheeseman): Titahi Bay, Cook Strait (Miss Mestayer): Taumaki Island, in 10 fathoms (Captain Bollons): Lyttelton Harbour (Iredale): Shag Point, Otago (Iredale).

Remarks.—The shell is very variable in size and shape, some shells being almost globular, with the spire-whorls very compressed; others are elongated and narrow, with the spire-whorls lengthened. The spiral striation may be very distinct, indistinct, or almost indistin-

guishable on account of the abrasions to which this shell is very subject. The apex of the shell may appear either on the left or on the right, or almost central. The teeth on the inner lip may both be very prominent, or the anterior one may be almost suppressed. (Iredale.)

Genus 4. Cremnobates, Swainson, 1855.

Cremnobates, Swainson, P.R.S. Van Diemen's Land, iii, pt. 1, Jan. 1855, 43; not of Günther, 1861 (*Pisces*), nor of Blanford, 1868 (*Mollusca*).

Swainson gives the following diagnosis: "Animal amphibious. Shell small, oval. Spire rather pointed, as long as the aperture. Aperture not contracted. Pillar with strong plaits. Inner lip thin, smooth inside." Three species are enumerated — (1) *C. cornea*, (2) *C. parva*, (3) *C. solida* — but the first is *Ophicardelus australis*, Q. & G., and the third *Marinula patula*, Lowe, leaving *C. parva* as the type of the genus.

Animal (in alcohol) with short tentacles, the eyes at their inner bases; foot long and narrow, truncated in front, narrowly rounded and simple behind, with a distinct transverse groove at the anterior third of length. Jaw horny, arcuate, with a median projection below and a shallow sinus above, vertically narrowly striated, the cutting-edge serrate. Radula broad and long, with numerous transverse slightly arcuate rows of minute teeth, which are exceedingly numerous, with a long and narrow base, and a minute cusp. I was unable to distinguish a central tooth distinct from the other teeth.

Shell small, oval, smooth, the spire as high as the aperture or a little less; aperture ovate, not contracted; the outer lip thin and simple; columella with 2 strong plaits on the upper half.

Distribution.—Tasmania, Antipodes Islands, Islands of St. Paul and Amsterdam, Tristan da Cunha.

Mr. Charles Hedley kindly informed me that the following species are no doubt members of the genus: (1) *Marinula Maindroni*, Vélain, Archiv. Zool. Expér., vi, 1877, 126, pl. 4, f. 26, from Amsterdam Island; (2) *Marinula nigra*, Philippi: Vélain, *op. cit.*, 125. pl. 4, f. 25, from Tristan da Cunha, St. Paul, and Amsterdam Islands. Thus the genus would appear to be of nearly circumpolar range.

1. **Cremnobates parva**, Swainson, 1855. Plate 24, fig. 5.

Cremnobates parva, Swainson, P.R.S. Van Diemen's Land, iii, pt. 1, Jan. 1855, 44, pl. 7, f. 3. *Ophicardelus parvus*, Swainson (*Cremnobates*): Tate and May, P.L.S. N.S.W., xxvi, 420.

Shell ovate, thin, light, covered with an epidermis; spire slender, pointed; pillar plaited: the first plait close to the top of the aperture, the second more towards the base (Swainson). *Sculpture* consisting of well-marked growth-lines. *Colour* whitish or light brown, the mouth light to dark brown. *Epidermis* thin, horny, lost in most of my

specimens, which are more or less corroded. *Spire* conic, typically of the same height as the aperture, but considerably lower in all the specimens from the Antipodes Islands. *Protoconch* minute, pointed. *Whorls* 4, the last very large, convex, a little flattened outside the suture; base flatly convex. *Suture* deep. *Aperture* vertical, ovate, angled above, rounded below. *Peristome* continuous. *Outer lip* thin and sharp, broadly arched. *Basal lip* regularly convex. *Columella* slightly oblique, with 2 strong white plaits, the upper one larger, near the top of the aperture, the lower one smaller and at about the middle of the columella. *Inner lip* smooth, white, spreading a little beyond the columella and uniting the margins of the peristome by a distinct sharp ridge. There is no trace of an *umbilical fissure*.

Diameter, 5 mm.; height, 7·5 mm. (largest specimen, from the Antipodes Islands).

Animal, *jaw*, and *radula* as described for the genus.

Type in Dr. Milligan's Museum.

Hab.—Antipodes Islands (Captain Bollons). The type is from Oyster Cove, near Hobart, Tasmania.

Remarks.—On examining the shells with the animals, kindly brought and presented to me by Captain Bollons, I came to the conclusion that they belonged to a genus of the *Auriculidæ* unknown to me, and perhaps new. However, I would not create a new genus without having consulted my friend Mr. Hedley, so I sent him a few specimens. He wrote to me, "The Auriculid from Antipodes is most interesting. It is certainly *Cremnobates parva*, Swainson, a rare and little-known form. Both genus and species have been generally ignored in subsequent literature." He also sent me at the same time all the necessary references, and a figure, which is reproduced in the atlas, for all of which I am very much obliged to my friend.

All the shells from the Antipodes have the spire considerably shorter than the aperture, but this would hardly appear to be sufficient reason for establishing a variety or subspecies. The type, figured by Swainson, has the height of the spire equal to that of the aperture; the total height is 7 mm.

Fam. **AMPHIBOLIDÆ**, Adams.

Animal having a large flattened disc-shaped head, lightly sinuated in front; eyes sessile, at the bases of the 2 small flattened triangular tentacles; pulmonary opening on the right side. Visceral mass spirally coiled; the sexes united, male genital orifice near the right eye. There is no jaw. Radula tongue-shaped, teeth in transverse lines. Central tooth multicuspidate; 2 laterals on each side, the inner small, unicuspidate, the outer tricuspidate; marginals uniform.

Shell spiral. Operculum present.

Genus 1. Amphibola, Schumacher, 1817.

Amphibola, Schum., Essai Nouv. Syst. Habit. Testacés, 1817, 58, 190. Type: *A. australis*, Schum. (= *crenata*, Mart.). *Ampullacera*, Quoy and mard, 1832. *Thallicera*, Swainson, 1840.

Head large, flattened; eyes at the upper sides of the very small tentacles, outside the snout; foot short, quadrilateral.

Shell thick, subglobose, and rugose; spire somewhat depressed; outer lip with a deep sinus posteriorly; inner lip callous and expanded; columella broad and reflected at the base; umbilicus large. Operculum horny, ovate, subspiral.

Distribution.—Australasia, Polynesia, Indian Ocean.

1. Amphibola crenata, Martyn, 1784. Plate 49, figs. 9, 9*a*.

Limax crenata, Mart., Un. Conch., ii, f. 69. *Helix crenata*, Gmelin, Syst. Nat., ed. xiii. 3623. *Bulimus avellana*, Bruguière, Encycl. Méth. (Vers.), i, 1789, 297. *Helix avellana*, Gmelin, Syst. Nat., ed. xiii, 3640. *Ampullacera avellana*, Quoy and Gaimard, Voy. Astrol., ii, 1832, 196, pl. 15, f. 1–9. *Thallicera avellana*, Swainson, "Malacology," 1840, 196. *Amphibola avellana*, Gmelin, C.M.M., 58; M.N.Z.M., 35. *A. australis*, Schum acher. Essai Nouv. Syst. Habit. Testacés, 1817, 190.

Shell subglobose, thick, whorls shouldered and keeled, rugosely plicate, umbilicate. *Sculpture* consisting of a rounded keel at the angle of the shoulder, and another, much less distinct, on the middle of the shoulder; a number of distant spiral cords on the periphery of the body-whorl, and a strongly raised keel round the umbilicus; the axial sculpture consists of distant sharp and strongly undulating lamellæ, continued over the umbilical keel, and entering the umbilicus; they sometimes reticulate the spirals on the body-whorl. On the spire-whorls the axial sculpture is usually much less distinct. Frequently the whole sculpture is more or less obsolete, the shells nearly smooth. *Colour* yellowish or reddish-brown; aperture chestnut, with indications of brown spiral bands above and below the sinus of the outer lip; peristome white inside, inner lip mostly brown or purple. *Spire* very short, conoidal, gradate, its height usually a little more than half the height of the aperture. *Protoconch* small, raised, smooth, the nucleus globose. *Whorls* 6½, with a slightly convex shoulder, body-whorl large, flatly convex at the periphery, base rounded. *Suture* well impressed. *Aperture* semicircular, oblique, broadly angled above, regularly rounded below. *Outer lip* strongly convex, thickened inside, especially toward the base, with a sharp edge and a moderately deep broadly rounded sinus at the angle of the shoulder. *Columella* very short, excavated, broadly rounded. *Inner lip* thick, rather broadly expanded upon the pillar, and extending over the lightly convex parietal wall. *Umbilicus* narrow, deep, partly covered by the reflected inner lip. *Operculum* dark brown, horny, with an apical nucleus and radiate striæ and plications.

Diameter, 25 mm.; height, 28 mm.

Anatomy. — Lehmann, Malak. Blätt., xiii, 1866, 111; Hutton, A.M.N.H. (5), iii, 1879, 181, pl. 22.

Dentition.—Hutton, T.N.Z.I., xiv, 156, pl. 4, f. F.

Type lost.

Hab.—Most estuaries of New Zealand. Brought to England by Captain Cook.

The animal lives between tide-marks in salt or brackish water on mud-flats in sheltered bays. When found at all, it is always found in large quantities. It is very sluggish in its habits, and feeds on the vegetable matter contained in the mud, passing large quantities through its alimentary canal. Although air-breathing, it will live for a week or ten days in fresh water, and for more than a fortnight in salt water, without being exposed to the air. (Hutton.)

Remarks.—The animal is eaten by Maoris and many white people.

Maori.—Titiko (*fide* Captain Bollons).

Fossil.—Post-Pliocene.

Fam. SIPHONARIIDÆ, Adams.

Animal having the head expanded, the tentacles atrophied, bilobed in front; eyes sessile on the outer sides of the disc. Visceral mass conical. Genital orifices contiguous. Respiratory orifice covered by a large fleshy lobe of the mantle. Aquatic pallial cavity containing secondary branchial laminæ. No operculum. Marine. Jaw arcuate, with simple or projecting margin and with vertical filaments above. Radula broad, rather long; teeth numerous, equal, in slightly arched transverse lines. Central tooth narrow, elongated, with a small rhombic apex; lateral teeth larger, diverging, gradually diminishing in size outwards.

Shell conical, patelliform, muscle-impression interrupted by a lateral groove on the right side corresponding with the pulmonary orifice.

Genus 1. Siphonaria, Sowerby, 1824.

Siphonaria, Sow., Genera Rec. & Foss. Shells, pt. 21, Jan. 3, 1824. First species: *S. sipho*, Sowerby.

Animal having the head large, flattened, divided into 2 equal rounded lobes, the small eyes on their upper surfaces. Pulmonary orifice on the middle of the right side, in line with the anal opening. Central tooth of radula unicuspidate, laterals bicuspidate, and the marginals tricuspidate, short, transverse.

Ova in white gelatinous rope-like masses, attached to rocks in irregular curves, much like ova of Nudibranchs. They may be found early in February, sometimes in great abundance.

Shell solid, inside polished, summit central or subcentral. Muscle-impression horseshoe-shaped, the anterior ends united by a groove corresponding to the line of attachment of the mantle to the shell; it is interrupted on the right side by a deep siphonal groove, which

produces a slight projection on the margin. External surface radially ribbed.

Distribution.— Warm and temperate seas, the maximum of the species in the Southern Hemisphere.

Fossil in the Eocene of Paris and Miocene of Piedmont.

KEY TO SPECIES.

A. Shell solid ; apex subcentral.
  a. Shell small, length less than 30 mm.
    b. Interior liver-brown, the centre darker. Lateral teeth of radula with the mesial cutting-point unidentate .. *australis.*
    bb. Interior chestnut, the centre yellowish with dark patches. Lateral teeth of radula with the mesial cutting-point bidentate .. .. *zelandica.*
    bbb. Interior purplish-brown with a white central spot ; surface black, the riblets white .. .. *Cookiana.*
  aa. Shell large, length more than 30 mm. Interior flesh-colour to orange, sometimes greyish.. .. .. .. *obliquata.*
B. Shell thin, fragile ; apex marginal. Apex posterior, uncinate, near the margin or extending beyond it .. .. .. *lateralis.*

Subgen. 1. SIPHONARIA, s. str.

1. Siphonaria australis, Quoy and Gaimard, 1833. Plate 24, fig. 6.

Siphonaria australis, Q. & G., Voy. Astrol., ii, 1833, 329, pl. 25, f. 32–34 ; C.M.M., 55 ; Crit. List, 39 ; J. de Conch., 1878, 42 ; M.N.Z.M., 36 ; T.N.Z.I., xv, 142.

Shell ovate-oblong, rather conical, with numerous ribs, but little projecting at the margin, interior usually liver-brown. *Sculpture* consisting of numerous unequal slightly undulating ribs, the elevation of the siphonal groove on the right side marked by broad bifurcate ribs, those of the ribs on the right side which reach the summit are wider apart than those on the remaining parts of the shell ; the ribs are raised, sharply rounded, and crossed by very fine concentric growth-lines ; at the margin they are but little or not projecting. *Colour* exteriorly reddish-brown, the ribs whitish ; interior usually liver-brown, the centre much darker ; outside the muscular scar a narrow light band, followed by a broader darker band, and the margin generally marked with white at the termination of each rib. *Apex* behind the middle and a little to the left, slightly uncinate in well-preserved specimens ; slope very lightly convex all round. *Inside* polished, the muscle-scar horseshoe-shaped, the frontal mantle-scar concave. *Margin* entire, sharp, or slightly denticulate.

Diameter, 10·5 mm. ; length, 14·5 mm. ; height, 6·3 mm. (type). Diameter, 17 mm. ; length, 22 mm. ; height, 10 mm. (specimen from Sumner).

Animal pale-yellowish, speckled with black on the sides of the foot and head.

Anatomy (Hutton, A.M.N.H. (5), ix, 341 ; T.N.Z.I., xv, 142, pl. 17, f. E–G).—Jaw arcuate, rounded at each end, concave margin papillate, remainder of surface reticulate. Radula having the formula 160 × 36 + 1 + 36 ; central tooth long and narrow, unicuspidate ; laterals about 19, with a mesial unidentate cutting-point and a small outer cutting-point ; marginals with 3 cutting-points, the mesial large.

Type in the Mus. Hist. Nat., Paris.

Hab.—In roots of *D'Urvillæa utilis :* Cook Strait, type (Q. & G.) ; Sumner, New Brighton, &c.

2. **Siphonaria Cookiana,** Suter, 1909. Plate 24, figs. 7, 7*a*, 7*b*.

Siphonaria Cookiana, Sut., P. Mal. S., viii, 1909, 258, pl. 11, f. 18.

Shell small, solid, oval, depressed conoidal, radiately ribbed, with subcentral apex. *Sculpture* consisting of about 17 smooth rounded primary ribs, extending from the summit to the margin ; the interstices with 1, rarely 2 or 3, secondary riblets which do not reach the apex ; the anterior primary rib above the siphonal groove is thicker than the others, and divided by a median groove ; growth-lines fine, close, concentric. The riblets are sometimes projecting a little at the margin. *Colour* black, the riblets white on approaching the base, but usually the shell is greyish-white, the interstices dark brown ; interior purplish-brown, polished, the groove white, usually with a broad oval white spot at the centre, the margin white or white and brown. *Apex* sharply rounded, more or less eroded, situate a little behind the middle and to the left ; slope lightly convex all round. *Interior* with the muscle-scar horseshoe-shaped, interrupted on the right side by the shallow groove. *Margin* sharp, lightly laciniate.

Diameter, 9 mm. ; length, 12 mm. ; height, 4·5 mm.

Animal unknown.

Type in my collection.

Hab.—Lyall Bay, Cook Strait (Miss Mestayer) ; Preservation Inlet.

Remarks.—It is allied to *S. exulorum*, Hanley, from Norfolk Island, which, however, is a thinner, more depressed species, with more numerous riblets, and without the interior white central spot and the white groove. *S. amara*, Hutt., from New Guinea, is also a near relation, but also with more numerous riblets, and devoid of the white central spot.

3. **Siphonaria obliquata,** Sowerby, 1825. Plate 48, fig. 9.

Siphonaria obliquata, Sow., Cat. Coll. Tankerville, 1825, app. 7 ; Conch. Icon., ix, f. 56 ; M.N.Z.M., 36 ; T.N.Z.I., xv, 141. *S. scutellum*, Deshayes, Guérin's Mag. Zool., 1841, pl. 35 ; Dieff. N.Z., 248. *S. diemenensis*, Quoy : Hutton, C.M.M., 55 ; not of Quoy and Gaimard.

Shell large, solid, oblong, conoidal, with tubercled radiate ribs. *Sculpture* consisting of about 20 to 25 bifurcating ribs, nearly all of which descend from the summit ; in young examples they are very

little raised, but as growth proceeds they are much raised, becoming undulating, and very often tubercled by pronounced concentric grooves representing periods of rest; they are usually not, or very little, projecting at the margin; on the right side, above the groove, the ribs are much more distant. *Colour* brown, the ribs bluish-white, but usually the shells are much corroded and of a brownish-grey colour; interior with the central area light brown, flesh-colour to orange, generally with a few irregular dark-brown blotches; outside the muscle-scar there is a whitish band, the margin brown, sometimes with white underneath the ribs. *Apex* posterior, a little to the left, slightly uncinate; posterior and left slope straight or a little concave, the others slightly convex. *Inside* polished, the siphonal groove shallow and very broad; frontal mantle-scar convex, very distinct; outside the muscle-scar the shell is mostly strengthened by a thick callosity. *Margin* sharp, denticulated and grooved inside.

Diameter, 25·5 mm.; length, 41 mm.; height, 13 mm. Diameter, 36 mm.; length, 56 mm.; height, 20 mm. (large specimen).

Animal dark blue-black, sole of the foot yellowish.

Anatomy (Hutton, T.N.Z.I., xv, 141, pl. 17, f. A–D).—Jaw arcuate, expanded at each end, with about 5 rounded ribs in the centre; anterior margin papillate, the rest smooth. Formula of radula $258 \times 68 + 1 + 68$; the teeth very much like those of *S. australis*. A. J. Cottrell, T.N.Z.I., xliii, 582, pl. 28, 29; xliv, 374, figs. in text.

Type in the British Museum.

Hab.—From Cook Strait southward—Stonyhurst, Sumner, Banks Peninsula, Timaru, Dunedin; Chatham Islands; Auckland Islands.

4. Siphonaria zelandica, Quoy and Gaimard, 1833. Plate 24, fig. 8.

Siphonaria zelandica, Q. & G., Voy. Astrol., ii, 1833, 344, pl. 25, f. 17, 18; C.M.M., 55; Crit. List, 39; J. de Conch., 1878, 41; T.N.Z.I., xv, 143. *S. cancer*, Reeve: Hutton, C.M.M., 55; J. de Conch., 1878, 41; M.N.Z.M., 36; Watson, Chall. Rep., xv, 674; not of Reeve. *S. scutellum*, Desh., C.M.M., 55; not of Deshayes. *S. sipho*, Sowerby, M.N.Z.M., 36; not of Sowerby. *S. inculta*, Gould, P. Bost. S.N.H., ii, 1846, 153; U.S. Expl. Exp., xii, 358, f. 465.

Shell very variable in form, ovate-oblong to semicircular, conoidal to almost quite flat, with more or less numerous sharply elevated radiate ribs. *Sculpture* consisting of numerous radiate ribs, of which 10 to 16 (usually 14) are primary, much larger than the others, and descending from the apex to the margin, where they are mostly more or less projecting; a strong bifurcating rib marks the siphonal groove, and is separated by a considerable space from the next primary ribs; interspaces usually with 1, on the right side with several, smaller and shorter secondary riblets; the primary ribs may be rounded and undulating, or sharply raised, straight; growth-periods often render the ribs slightly tubercled. *Colour* ash-brown, the ribs sometimes

lighter; interior mostly chestnut-brown, the centre yellowish, generally with dark-brown patches; a narrow marginal line, or often only the tips of the projecting ribs, yellowish. *Apex* submedian, obtuse. *Interior* polished, the frontal mantle-scar straight, groove narrow, well marked. *Margin* mostly undulating, sharp, grooved inside.

Diameter, 16·8 mm.; length, 19 mm.; height, 8·4 mm. (type). Diameter, 20 mm.; length, 25 mm.; height, 9·5 mm. (large specimen).

Anatomy.—Hutton, A.M.N.H. (5), ix, 1882, 341, pl. 15; T.N.Z.I., xv, 143, pl. 17, f. H–M.

Dentition.—Formula of radula 130 to 140 × 33 to 40 + 1 + 33 to 40; the central tooth narrow, with 1 cusp; laterals about 13, with the mesial cutting-point bidentate and a small cutting-point on the outside; marginals with 3 cutting-points, the median the largest, and bidentate on the inner marginals, simple and rounded on the outer ones.

Type in the Mus. Hist. Nat., Paris.

Hab.—Throughout New Zealand, common; Chatham Islands.

Remarks.—This is the most variable of our species of the genus, the shell being very often adapted to the surroundings. High conoidal to flattish and oval to semicircular shells are met with. The distinct and projecting primary ribs, the much darker brown colour of the interior, and especially the dentition, separate it from *S. australis*.

Subgen. 2. Liriola, Dall, 1870.

Shell thin and fragile, with fine ribs, which leave the margin entire. Apex marginal or submarginal.

5. Siphonaria lateralis, Gould, 1846. Plate 49, fig. 10.

Siphonaria lateralis, Gould, P. Bost. S.N.H., ii, 1846, 153; U.S. Expl. Exp., xii, 363, pl. 30, f. 462; Pelseneer, Voy. "Belgica," Zool., 1903, 9; Strebel, Zool. Jahrb., xxv, 1907, 172, pl. 3, f. 27, 28, 29, 29*a*; Strebel, Schwedische Sudpolar Exp., 1901–3, vi, pt. 1, 1908, 8. *S. redimiculum*, Reeve, Conch. Icon., ix, 1856, pl. 5, f. 24; E. A. Smith, Trans. Roy. Soc. London, 1879, 16; Hutton, M.N.Z.M., 36; T.N.Z.I., xv, 143; Martens, Deutsche Tiefsee Exp. "Valdivia," 1903, 72; Melvill and Standen, Trans. Roy. Soc. Edinburgh, xlvi, pt. 1, 142. *Kerguelenia redimiculum*, Rve.: Rochebrune and Mabille, Miss. Cap Horn, 29. *S.* (*Liriola*) *tristensis*, Leach: Watson, Chall. Rep., xv, 675; Hutton, Index, 68, not of Leach.

Shell ovate-oblong, rather depressed, apex posterior, turned to the left, surface radiately ribbed, solid, thin at the margin. *Sculpture* consisting of about 25 distant flatly rounded undulating radial ribs, crossed by fine concentric growth-laminæ. *Colour* reddish or greenish-brown; interior dark purple, lighter under the apex, but sometimes the latter part is darker, and the margin light brown. *Epidermis* generally present only near the margin, greenish or brown, horny. *Apex* posterior, uncinate, bent to the left, near the margin, marginal or extending beyond the margin. *Anterior slope* convex, left side

slope short and straight, right side slope broader and lightly convex, posterior slope concave. *Interior* polished, the muscle-scar well impressed, the siphonal groove usually shallow, but sometimes deeper and broad, the shell with a pronounced bulge on the outside. *Margin* thin, fragile, slightly membranous.

Diameter, 16 mm.; length, 24 mm.; height, 9 mm. (Antipodes Island). Diameter, 17 mm.; length, 24 mm.; height, 8·5 mm. (Auckland Islands). Diameter, 13 mm.; length, 18 mm.; height, 5·5 mm. (Campbell Island). Diameter, 16 mm.; length, 21·5; height, 7·5 mm. (Macquarie Island).

Anatomy and *Dentition.* — Hutton, T.N.Z.I., xv, 143, pl. 17, f. N–R; Studer, Mitth. Naturf. Gesellsch. Bern, 1880, 14.

Jaw arcuate, tapering to each end: surface covered with minute papillæ.

Radula having the formula $120 \times 44 + 1 + 44$, laterals about 20. Central tooth very narrow, its length being four times its breadth. Laterals with the cutting-point bidentate and continued down on each side of the cusp; inner marginals with 2 cutting-points, the inner larger and simply rounded at the end; outer marginals with 3 cutting-points, the median the largest and rounded at the end. (Hutton.)

Type in the U.S. National Museum, Washington.

Hab.—Antipodes Islands; Auckland and Disappointment Islands; Campbell Island (Captain Bollons); Macquarie Island (A. Hamilton). Also Tasmania, Kerguelen Land, Patagonia, Strait of Magellan, Falkland Islands.

Fam. GADINIIDÆ, Gray.

Animal with a distinct, flattened head. Visceral mass conical; pulmonary cavity aquatic, but without a branchia; genital orifices separated. Foot flat, thin, simple. There is no jaw.

Shell conic, patelliform.

Genus 1. GADINIA, Gray, 1824.

Gadinia, Gray, Phil. Mag. & Journ., 1824, 63. Type: *G. afra*, Gmel. *Mouretia*, Sowerby, 1835.

Animal having a circular foot; pulmonary orifice on the right side near the head, closed by a small lobe. Head large, flattened, divided in front into 2 triangular auriform expansions. No tentacles. Eyes sessile on the sides of the head behind the auriform processes. Male genital orifice near the right eye. Radula with the central tooth usually unicuspidate; lateral teeth tricuspidate, the median cusp narrow, long, and sharp; marginals short, bicuspidate.

Shell obliquely conic; apex obtuse, subposterior; aperture orbicular, with a small groove directed from the centre to the anterior side of the right margin, tangential to the end of the muscle-scar, which is

horseshoe-shaped and broadly open in front. There is a small muscular scar in front of the left end of the adductor-scar.

Distribution.—Mediterranean, west coast of Africa, Mauritius, west coast of America, Australasia.

1. **Gadinia nivea**, Hutton, 1878. Plate 24, fig. 9.

Gadinia nivea, Hutt., J. de Conch., xxvi, 1878, 36; T.N.Z.I., x, 296, xv, 144; M.N.Z.M., 37.

Shell ovate, conoidal, generally depressed, radiately ribbed, apex rather posterior. *Sculpture* consisting of about 40 subequal narrowly rounded straight riblets, some of which do not extend to the summit; concentric growth-periods are mostly present, and very often producing prominent ridges. *Colour* white, light-pinkish towards the margin; interior white, the margin light pink. *Apex* subcentral to nearly marginal, small and distinctly uncinate in well-preserved specimens; anterior and side slopes convex, posterior slope straight, concave, or lightly convex. *Interior* shining, the adductor-scar and siphonal groove distinct. *Margin* very slightly crenulate.

Diameter, 18 mm.; length, 20·5 mm.; height, 3·7–5 mm.

Anatomy.—Hutton, T.N.Z.I., xv, 144, pl. 17, f. 8–V.

Dentition.—Formula of the radula $150 \times 60 + 1 + 60$, transverse rows forming an angle of about 90°, re-entrant anteriorly. Central tooth with 4 minute denticles; laterals about 21, each with a long pointed cutting-point and a small denticle on the inner side. Marginals with a long median cutting-point and a small denticle on the inner side.

Type in the Otago University Museum, Dunedin.

Hab.—Coast of Otago (type); Whangarei (C. Cooper); East Cape; Stonyhurst (F. Suter); near Taumaki Island, in 10 fathoms, small dead shells (Captain Bollons); Chatham Islands. Living on rocks between tide-marks, and in roots of *D'Urvillæa utilis;* not common.

Fam. LYMNOËIDÆ.

Limnœidæ, Broderip.

Animal with a short broad muzzle, dilated at the end; mouth with a horny upper jaw; tentacles flattened or filiform, with the eyes sessile, at their inner bases. Mantle-margin variously modified; respiratory orifice at the right side. Foot flattened, lanceolate, or ovate. Excretory orifices on the left side of the neck. No inferior pallial lobe.

Shell thin, dextal, with prominent spire and oval aperture. No operculum.

Their distribution is world-wide. They live in lakes, ponds, pools, ditches, and, though not so abundantly, in rivers; occasionally they are found in brackish waters. They crawl on the mud and stones at the bottom, or on water-plants, and in warm sunny weather ascend

to the surface, and creep, as it were, reversed on the surface of the water. They lay their eggs in consistent transparent gelatinous masses on the leaves and stems of water-plants, or on stones.

Fossil they first appear in the Lias.

KEY TO GENERA.

A. Shell wholly external, with a pointed spire .. .. LYMNOËA.
B. Shell in great measure covered by the mantle, globular, with a very short spire .. .. AMPHIPEPLEA.

Genus 1. LYMNOËA, Lamarck, 1799.

Limnoëa, Lam., Mém. Soc. Nat. Hist. Paris, 1799, 75. Type: *Helix stagnalis*, L. *Limnæa*, Lam., 1801. *Limnaeus*, Drap. *Lymnus*, Montf.

Animal spiral, not covering the shell when emerging from it; head large; tentacles triangular, flattened; eyes sessile, situated at the inner bases of the tentacles; pulmonary orifice protected by a projecting lobe. Jaw composed of 3 segments. Central tooth of radula very small; laterals bicuspidate; marginals multicuspidate.

Shell spiral, thin, and horny, mostly dextral; spire pointed; aperture oval, ample, rounded in front, the margins united by a thin callosity; peristome thin, sharp; columella more or less twisted.

Distribution.—In fresh water of all latitudes, from Greenland to the Straits of Magellan; in lakes of high altitude; and in all different kinds of water, even brackish. One species (*L. abyssicola*) has been dredged alive in the Lake of Geneva in depths from 75 to 250 metres.

The oldest known forms are Jurassic.

KEY TO SPECIES.

A. Height of spire a little less than that of the aperture.
  a. Shell elongate-oval, the last whorl slightly ventricose; a small umbilical chink .. .. *Alfredi.*
  aa. Shell oblong, the last whorl moderately convex, high; no umbilical chink .. .. *pusilla.*
B. Height of spire equal to that of the aperture. Shell elongate-oval, the last whorl not ventricose; columella with a slight median fold; a narrow umbilical chink .. .. *tenella.*
C. Height of spire two-thirds that of the aperture; body-whorl with 4–5 obsolete spiral ridges, ventricose .. .. .. *leptosoma.*
D. Height of spire half that of the aperture. Shell oblong-conic, with downy hairs; columella arcuate .. .. .. *tomentosa.*

1. Lymnoëa Alfredi, Suter, 1890. Plate 24, fig. 10.

Limnæa Alfredi, Suter, T.N.Z.I., xxii, 1889 (1890), 229, pl. 15, f. 17; Hedley and Suter, P.L.S. N.S.W. (2), vii, 1893, 626. *L. Tenisoni*, Cless., var. *Alfredi*, Sut., J. de Conch., xli, 1893 (1894), 230.

Shell small, thin and fragile, elongated oval, semitransparent, glossy. The only *sculpture* consists of very fine and close flexuous growth-lines, with an occasional period of rest. *Colour* horn-yellow. *Epidermis* very thin, membranous. *Spire* elevated conic, its height very little less than that of the aperture; outlines slightly convex.

Protoconch small, obtuse, mostly eroded. *Whorls* 4, gradually increasing, flatly convex, the last high, slightly ventricose; base convex. *Suture* deep. *Aperture* ovate, angled above, rounded below. *Outer lip* broadly convex, thin and sharp. *Basal lip* more narrowly rounded. *Columella* subvertical, straight, inconspicuously twisted. *Inner lip* narrow, reflexed over the pillar, leaving a small umbilical chink, very thin on the lightly convex parietal wall.

Diameter, 4 mm.; height, 7·5 mm.; aperture, 3 mm. by 4·5 mm. Diameter, 5 mm.; height, 9·5 mm. (Birch Hill Lagoon specimen).

Dentition (Suter, T.N.Z.I., xxiv, 300, pl. 23, f. 55. 56).—Jaw consisting of three pieces. Formula of radula $90 \times 16 + 5 + 1 + 5 + 16$. Central tooth small, bicuspidate; laterals quadrangular, with 2 cutting-points; marginals tridentate.

Type in my collection.

Hab.—Creek near Governor's Bush, Hooker Valley, type (A. Suter); lagoon at Birch Hill Station, Tasman Valley (H. S.); lake on Arthur's Pass; Ashburton (W. W. Smith).

2. **Lymnoëa leptosoma,** Hutton, 1885. Plate 24, fig. 11.

Limnæa leptosoma, Hutt., T.N.Z.I., xvii, 1884 (1885), 55, pl. 12, f. 3; Hedley and Suter, P.L.S. N.S.W. (2), vii, 625; Suter, J. de Conch., xli, 1893 (1894), 230.

Shell small, ovate, acuminate above, glossy, fairly solid, horny. *Sculpture* consisting of 4 or 5 obsolete distant spiral ridges on the body-whorl, and rather strong axial striæ. *Colour* pale-horny, with indications of darker spiral bands near the aperture. *Epidermis* thin, slightly shining. *Spire* rather short, conic, about two-thirds the height of the aperture; outlines slightly convex. *Protoconch* small, of 1 smooth globular whorl, semitransparent. *Whorls* 4, rather flattened, the last large, somewhat ventricose; base rounded. *Suture* deep. *Aperture* ovate, vertical, angled above. *Outer lip* thin and straight, lightly convex. *Basal lip* narrowly rounded. *Columella* oblique, rounded, inconspicuously twisted. *Inner lip* callously and broadly reflexed over the body-whorl, and completely covering the umbilical area.

Diameter, 6·75 mm.; height, 12 mm.; aperture, 5 mm. by 8·5 mm. (type).

Animal unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—Wellington.

3. **Lymnoëa pusilla,** Hutton, 1885 (em.). Plate 24, fig. 12.

Limnæa pucilla, Hutton, T.N.Z.I., xvii, 1884 (1885), 56, pl. 12, f. 5. *Limnæa pusilla,* Hutt.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 625; Suter, J. de Conch., xli, 1893 (1894), 230.

Shell very small, oblong, glossy, translucent, thin and fragile. *Sculpture* consisting of very fine growth-lines. *Colour* light-horny.

Epidermis thin, somewhat shining. *Spire* slightly raised, conic, its height a little less than that of the aperture. *Protoconch* small, globular. *Whorls* 4, moderately convex, the last high; base rounded. *Suture* impressed. *Aperture* oval, rather narrow, angled above. *Outer lip* lightly convex, thin and sharp. *Basal lip* very narrowly arched and somewhat effuse. *Columella* vertical, straight, very little twisted. *Inner lip* very thin, narrowly expanded over the umbilical tract, broader upon the nearly straight parietal wall.

Diameter, 2·5 mm.; height, 4 mm. (type).

Animal unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—Auckland.

4. Lymnoëa tenella, Hutton, 1885. Plate 24, fig. 13.

Limnæa tenella, Hutt., T.N.Z.I., xvii, 1884 (1885), 55, pl. 12, f. 4; Hedley and Suter, P.L.S. N.S.W. (2), vii, 625; Suter, J. de Conch., xli, 1893 (1894), 230.

Shell very small, elongately oval, not glossy, dark-horny. *Sculpture* consisting of fine growth-lines only. *Colour* olive-horny. *Epidermis* thin, transparent. *Spire* moderately elevated, conical, of the same height as the aperture. *Protoconch* small, broadly rounded. *Whorls* 4, moderately convex, the last not ventricose; base rounded. *Suture* well impressed. *Aperture* subvertical, ovate, angled above. *Outer lip* thin and sharp, convex. *Basal lip* broadly arched. *Columella* slightly oblique, with a slight median fold. *Inner lip* not produced beyond the pillar, leaving a narrow umbilical chink, extending over the flattish parietal wall.

Diameter, 1·75 mm.; height, 4·5 mm.

Animal yellowish-white, semitransparent, the head between the eyes and the centre of the rostrum yellowish-brown. Foot emarginate in front; tentacles triangular, flattish, very short. Eyes triangular.

Dentition (Hutton, *l.c.*, 56, pl. 12, f. 11).—Formula of radula 20+1+20, about 6 or 8 laterals. Central tooth long and narrow, laterals bicuspid, marginals tricuspid.

Type in the Canterbury Museum, Christchurch.

Hab.—River Heathcote, Christchurch.

5. Lymnoëa tomentosa, Pfeiffer, 1855.

Succinea tomentosa, Pfr., P.Z.S., 1854 (1855), 297; M.H. Viv., iv, 814; Reeve, Conch. Icon., xviii, Succinea, f. 81; Hector, Cat. Land Moll. N.Z., 1873, 3; Hutton, M.N.Z.M., 13; Clessin, Nomenclator Hel. Viv., 414. *Limnæa tomentosa*, Pfr.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 625; Suter, J. de Conch., xli, 229.

Shell small, oblong, conical, thin, pellucid, not shining, covered with downy hairs. *Colour* pale-horny. *Spire* conical, acute, half the height of the aperture. *Whorls* 3, the second convex, the last large, attenuated at the base. *Aperture* oblique, anteriorly produced. *Outer*

lip simple, rather expanded. *Columella* subcallous, slightly plaited, arcuated.

Diameter, 5 mm. ; height, 8 mm. : aperture, 4 mm. by 6 mm.

Dentition (Hutton, T.N.Z.I., xvii, 55, pl. 12, f. 9).—Central tooth long and narrow, the reflexed portion small. Laterals bicuspid.

Type in the British Museum.

Hab.—Auckland (ex Cuming collection) ; confirmed by Gillies.

Genus 2. Amphipeplea, Nilsson, 1822.

Amphipeplea, Nils., Hist. Moll. Suec., 1822, 58. Type : *Buccinum glutinosum*, Müller. *Buccinum*, Müller, 1774 (in part). *Helix*, Gmelin, 1788 (in part). *Bulimus*, Bruguière, 1789 (in part). *Limneus*, Draparnaud, 1801.

Animal short and thick ; the 2 tentacles short, triangular, flat, the eyes at their inner bases ; foot oval, elongate, rounded posteriorly. Mantle well developed, reflexed and partly or wholly covering the shell. Jaw and radula as in *Lymnoëa*.

Shell broadly oval or almost globular, imperforate, thin and fragile, hyaline, shining ; whorls 3 to 4, rapidly increasing, the last very large, occupying nearly the whole of the shell ; spire depressed ; aperture wide, rotundly ovate ; columella arcuate, with a thin inner lip ; outer lip simple and sharp.

Distribution.—Europe, Philippines, Moluccas, Australasia.

The animals crawl slowly, and appear to prefer tranquil waters and muddy localities.

Key to Species.

A. Shell yellowish or greenish, sometimes with a white spiral band on the middle of the body-whorl ; height of spire a little less that half that of the aperture .. .. *ampulla.*
B. Shell dark olive-green to horny-brown ; spire about one-quarter that of the aperture in height .. .. *arguta.*

1. Amphipeplea ampulla, Hutton, 1885. Plate 24, fig. 14.

Limnæa (*Amphipeplea?*) *ampulla*, Hutt., T.N.Z.I., xvii, 1884 (1885), 55, pl. 12, f. 2. *Amphipeplea ampulla*, Hedley and Suter, P.L.S. N.S.W. (2), vii, 24 ; Suter, J. de Conch., xli, 1893 (1894), 231.

Shell ovate, very thin and fragile, semitransparent. *Sculpture* consisting of fine plait-like growth-lines. *Colour* yellowish-horny or greenish, rarely with a white spiral band on the centre of the body-whorl. *Epidermis* very thin and shining. *Spire* acute, short, its height less than half that of the aperture. *Protoconch* globular, with a minute rounded nucleus. *Whorls* $3\frac{1}{2}$, the last swollen ; base convex. *Suture* rather deep. *Aperture* broadly oval, angled above. *Outer lip* thin, straight, sharp, regularly convex. *Columella* vertical, slightly arcuate, with a well-marked plait. *Inner lip* broadly reflected and thickened on the columella, spreading as a thin glaze broadly over the convex parietal wall.

Diameter, 6·75 mm. ; height, 10·25 mm. : aperture, 4·25 mm. by 7 mm. (type).

Dentition (Hutton, T.N.Z.I., xvii, 55, pl. 12, f. 8).—Formula of radula 28 + 1 + 28, with about 9 laterals. Central tooth narrow, with a small cutting-point ; laterals tricuspidate ; marginals multicuspidate.

Type in the Canterbury Museum, Christchurch.

Hab.—Lake at Arthur's Pass, type (D. Brown) ; swamp at Birdling's Flat ; Kowai Bush ; Ashburton ; near Christchurch ; Petone ; Waipoua River, Masterton ; Wanganui ; Toko, near Stratford ; Western Springs, Auckland ; pond, Mount St. John ; pond near St. Jones's Lake.

Var. **globosa**, Suter, 1891.

Amphipeplea ampulla globosa, Suter, T.N.Z.I., xxiii, 1890 (1891), 93, pl. 18, f. 12, *a–c*. *Amphipeplea ampulla*, var. *globosa*, Hedley and Suter, P.L.S. N.S.W. (2), vii, 626 ; Suter, J. de Conch., xli, 1893 (1894), 231.

Shell ovate, inflated, very thin and fragile, transparent, faintly shining. *Sculpture* consisting of plait-like close and well-marked growth-lines. *Colour* pale-horny. *Spire* short, acute, apex sometimes eroded. *Whorls* 4, the last large and inflated. *Suture* impressed. *Aperture* large, ovate, occupying about three-fourths of the height of the shell. *Outer lip* thin and sharp, not reflected. *Columella* arcuate, with a light spiral fold. *Inner lip* very broadly reflected over the body, and covering the umbilical area.

Diameter, 9 mm. ; height, 13 mm. : aperture, 6 mm. by 10 mm. (type).

Animal and *dentition* the same as in the species.

Type in my collection.

Hab.—Lagoon at Birch Hill Station, Tasman Valley, type (H. S.) ; near Wanganui (R. Murdoch).

Remarks.—This variety differs from the species in the more globose form, larger size, lighter colour, and the greater fragility and transparency. The spire is, as a rule, somewhat shorter, and the reflexed portion of the inner lip broader. It is very closely allied to the Tasmanian *A. launcestonensis*, T.-Woods.

2. **Amphipeplea arguta**, Hutton, 1885. Plate 24, fig. 15.

Limnæa (*Amphipeplea*) *arguta*, Hutt., T.N.Z.I., xvii, 1884 (1885), 54, pl. 12, f. 1. *Amphipeplea arguta*, Hedley and Suter, P.L.S. N.S.W. (2), vii, 626 ; Suter, J. de Conch., xli, 1893 (1894), 231 ; T.N.Z.I., xxxvii, 250.

Shell small, globosely ovate, glossy, thin and fragile, semitransparent. *Sculpture* consisting of fine growth-striæ only. *Colour* dark olive-green when alive, horny-brown when dry. *Epidermis* thin, transparent, shining. *Spire* very short, slightly acute, about one-fourth the height of the aperture. *Protoconch* small, rounded, usually eroded. *Whorls* 3 to 3½, the last inflated and occupying the greater

part of the shell. *Suture* moderate. *Aperture* large, ovate, broadly angled above. *Outer lip* convex, thin and sharp. *Basal lip* narrowly rounded. *Columella* arcuate, with a well-marked spiral fold. *Inner lip* rather broadly reflexed, thin and white, covering the umbilical area, and spreading over the flattish parietal wall.

Diameter, 4·5 mm.; height, 7·5 mm.: aperture, 4·25 mm. by 6 mm. (type).

Animal olive-brown, sparingly speckled with yellowish-white. Edge of the mantle simple, slightly reflected over the shell. Foot broad and rounded behind; tentacles short, flat, triangular, with the eyes at the inner bases.

Dentition (Hutton, *l.c.*, 54, pl. 12, f. 10; Suter, T.N.Z.I., xxxvii. 251, f. 11–14).—Central tooth with 1 or 2 small denticles; laterals with 3 cutting-points; marginals with 3 to 4 denticles.

Ova attached to stones or water-plants in gelatinous lumps of 10–20 together.

Type in the Canterbury Museum, Christchurch.

Hab.—River Avon, Christchurch (type); Lake Takapuna; Lake Waikare; Lake Taupo, in 20 ft. to 80 ft.; Lake Wakatipu, in 200 ft. to 300 ft., also in 30 ft. to 60 ft.

Fam. PLANORBIDÆ, Adams.

Animal having the visceral mass sinistrally coiled; inferior pallial lobe very prominent, and transformed into a branchia; tentacles tapering.

Shell sinistral, discoidal, usually consisting of many slowly increasing whorls.

Distribution.—World-wide.

Genus 1. PLANORBIS (Geoffroy), O. F. Müller, 1774.

Planorbis, Geoffroy, Traité Coq., 1767, 12; Müller, Verm., ii, 1774, 152. Type: *Helix cornea*, L. *Helix*, Linné (in part). *Angarius*, Martini, 1773. *Orbis*, Schröter, 1776. *Nautilus*, Lightfoot, 1786.

Animal elongated, slender; mantle with a thickened margin; foot short, truncated in front, rounded behind. Tentacles long, filiform. Jaw consisting of 3 parts. Central tooth of radula bicuspidate, laterals with 3 cusps, and marginals serrate. Genital orifices distant.

Shell sinistral, more or less discoidal; spire flat, depressed on one or both sides; whorls slowly increasing, all of them visible from both sides; aperture small; peristome sharp, continuous.

Distribution.—Universal.

Fossil from the Jurassic.

These molluscs live mostly in tranquil fresh water with an abundance of plants in it, especially swamps; they are rarer in flowing water and the larger lakes. They have been found at altitudes of 12,000 ft.

1. Planorbis corinna, Gray, 1850. Plate 24, fig. 16.

Planorbis corinna, Gray, P.Z.S., 1849 (1850), 167; A.M.N.H. (2), vii, 67; Conch. Icon., xx, pl. 24, f. 122; M.N.Z.M., 32; T.N.Z.I., xvii, 57, pl. 12, f. 6 (animal); Suter, T.N.Z.I., xxxvii, 252; J. de Conch., xli, 231; Hedley and Suter, P.L.S. N.S.W. (2), vii, 626.

Shell small, discoidal, periphery round, spire depressed. *Sculpture* consisting of fine oblique growth-lines only. *Colour* greenish-white or light brown. *Epidermis* thin, not or only faintly shining. *Spire* depressed. *Protoconch* minute, globular. *Whorls* 3 to 4, slowly increasing, the first two flat, the others gradually rising; periphery convex; base flat. *Suture* deep. *Aperture* subcircular, slightly excavated by the convex parietal wall. *Peristome* discontinuous, the margins connected by a parietal callus. *Basal lip* advancing.

Diameter, 4·5 mm.; height, 1·1 mm. (large specimen of 4 whorls).

Animal semitransparent, greyish, minutely speckled with smoke-brown. Foot short, tapering posteriorly, rounded behind and in front. Rostrum emarginate. Tentacles cylindrical, rounded at the tip, widely separated at the base. Eyes large, round, situated at the inner bases of the tentacles. (Hutton.)

Type in the British Museum.

Hab.—Auckland, type (Greenwood); ditch near Lake Takapuna; Mount St. John; Western Springs, Auckland; Onehunga; Lake Waikare; Petane; River Avon, Christchurch; Lake Wakatipu.

Genus 2. Isidora, Ehrenberg, 1831.

Isidora, Ehbg., "Symbolæ Physicæ," 1831. Type: *Physa contorta*, Mich. *Bulinus* (Adanson) and *Bullinus* of authors. *Diastropha*, Gray, 1840. *Ameria*, H. Adams, 1861. *Glyptophysa*, Crosse, 1872. *Pyrgophysa*, Crosse, 1879. *Physastra*, Tapparone Canefri, 1883.

Animal without the produced and reflected mantle-lobes of *Physa*; radula approaching *Planorbis* rather than *Limnœa*; central tooth bicuspid, cusps rather blunt, base square; laterals tricuspid, from 6 to 10; marginals serrate, numbering 25 to 33. Number of rows varying between 140 and 220. Jaw as in *Planorbis*.

Shell sinistral, resembling that of *Physa*, acuminated or gibbous, smooth or keeled; texture somewhat thick, covered with a deciduous epidermis; columella strong; inner lip often reflected; umbilicus sometimes wide and deep.

Distribution.—Australia, Tasmania, New Zealand, New Guinea, New Caledonia, Fiji, Tonga, Africa (except most of the eastern part), southern France, Spain, and all countries bordering the Mediterranean.

Fossil.—The genus first appears in the Jurassic.

Key to Species.

A. Shell spirally punctate lirate; fusiform; height of spire a little less than half that of the aperture .. .. *lirata.*

B. Shell without spiral sculpture.
  a. Whorls convex, never distinctly shouldered.
    b. Height of spire about two-thirds that of the aperture.
      c. Shell fusiform, imperforate; columella with a fold above .. .. *antipodea.*
      cc. Shell ovate, the last whorl ventricose, with an umbilical chink; columella slightly twisted *Hochstetteri.*
    bb. Height of spire equal to that of the aperture .. *tabulata.*
  aa. Whorls distinctly shouldered or convex.
    b. Height of spire a little less than that of the aperture; columella with a prominent fold above .. *novæ-zelandiæ.*
    bb. Height of spire about two-thirds that of the aperture; columella somewhat twisted. Contour resembling that of *I. tirata* .. .. .. *moesta.*

1. Isidora antipodea, Sowerby, 1873. Plate 24, fig. 17.

Physa antipodea, Sow., Conch. Icon., xix, f. 37; Hutton, M.N.Z.M., 30. *Aplexa antipoda*, Sow: Hutton, P.L.S. N.S.W., vii, 67. *Bulinus antipodeus*, Sow.: Hutton, T.N.Z.I., xvii, 56; Hedley and Suter, P.L.S. N.S.W. (2), vii, 627; Suter, J. de Conch., xli, 233. *Isidora antipodea*, Sow.: Suter, T.N.Z.I., xxxvii, 273, f. 5 (reversed); xxxviii, pl. 19, f. 5.

Shell fairly large, fusiform, thin and fragile. *Sculpture* formed by fine slightly flexuous and close growth-lines, no spirals. *Colour* ferruginous brown. *Epidermis* thin, opaque, not shining. *Spire* elevated, conic, about two-thirds the height of the aperture; outlines convex. *Protoconch* small, rounded, mostly eroded. *Whorls* 4 to 4½, convex, the last ovate, swelled in the middle; base flatly rounded. *Suture* impressed. *Aperture* large, ovate, angled above. *Peristome* regularly arched, thin and sharp; base slightly effuse. *Columella* oblique, with an oblique elevated fold above. *Inner lip* narrow, reflexed, and perfectly covering the umbilicus, spreading as a thin layer over the lightly convex parietal wall.

Diameter, 12 mm.; height, 22 mm. (from Sowerby's figure). Diameter, 11 mm.; height, 18·5 mm. (aperture 6 mm. by 12 mm.). Proportion of diameter to height, 1 : 1·7 to 1 : 1·8. Proportion of diameter to height of aperture, 1 : 2. Proportion of height of aperture to height of shell, 1 : 1·5 to 1 : 1·7.

Animal unknown.

Type in the British Museum.

Hab.—Lake Hayes, Otago; Lake Wakatipu; near Napier (*fide* F. Hutchinson, jun.).

Remark.—This seems, as far as our scanty knowledge goes, to be the only one of our species that has constantly smooth whorls.

2. Isidora Hochstetteri, Dunker, 1862. Plate 24, fig. 18.

Physa Hochstetteri, Dkr., Malak. Blätter, ix, 1862, 150. *P. guyonensis*. T.-Woods, P.L.S. N.S.W., iii, 1879, 138, pl. 13, f. 4; Hutton, M.N.Z.M., 30. *P. guyonensis* and *Hochstetteri*, Hutton, P.L.S. N.S.W., vii, 67. *Bulinus guyonensis* and *Hochstetteri*, Hedley and Suter, P.L.S. N.S.W. (2), vii, 627, 628. *Bullinus guyonensis* and *Hochstetteri*, Suter, J. de Conch., xli, 232, 233. *Isidora Hochstetteri*, Dkr.: Suter, T.N.Z.I., xxxvii, 272, f. 3 (reversed); xxxviii, pl. 19, f. 3.

Shell moderately large, ovate, subperforate, slightly striate, shining. *Sculpture* consisting of very fine and close growth-lines only. *Colour* yellowish-horny, olive, or fulvous. *Epidermis* thin, polished. *Spire* elevated, broadly conical, about two-thirds the height of the aperture; outlines convex. *Protoconch* very small, globular, mostly somewhat eroded. *Whorls* 4 to 5, convex, sloping below the suture, the last high and ventricose, somewhat flattened in the middle, indistinctly biangulate. *Suture* deep. *Aperture* ovate, angled above. *Outer lip* broadly convex, thin and sharp. *Basal lip* narrowly rounded and somewhat effuse. *Columella* vertical, straight, slightly twisted. *Inner lip* narrow, but little reflexed, leaving a narrow umbilical chink: extending as a thin layer over the lightly convex parietal wall.

Diameter, 9 mm.; height, 17 mm. Proporcion of diameter to height, 1 : 1·6. Proportion of diameter to height of aperture, 1 : 1·9. Proportion of height of aperture to height of shell, 1 : 1·6.

Animal unknown.

Type in the K.K. Hofmuseum, Vienna.

Hab.—Lake Guyon, Nelson; Lake Nga-tu, near Kaitaia (R. H. Matthews).

3. Isidora lirata, T.-Woods, 1879. Plate 24, fig. 19.

Physa lirata, T.-Woods, P.L.S. N.S.W., iii, 138, pl. 13, f. 6; Hutton, M.N.Z.M., 31; T.N.Z.I., xvii, 57. *Isidora lirata*, T.-Woods: Suter, T.N.Z.I., xxxvii, 274, f. 6 (reversed); xxxviii, pl. 19, f. 6.

Shell rather small, imperforate or rimate, elongately ovate, thin and fragile, subdiaphanous. *Sculpture* consisting of distant fine punctate spiral striæ, crossed by undulating fine growth-lines. *Colour* yellowish-horn, very often with a brown-ferruginous coating. *Epidermis* thin, transparent, very often produced into short light-brown bristles on the carina of the whorls. *Spire* short, acute, its height a little less than half that of the aperture. *Protoconch* minute, mostly eroded. *Whorls* 3½ to 4, the last very high and inflated, usually strongly carinated, with a flat shoulder, but sometimes smooth and convex; base flatly convex. *Suture* lightly impressed. *Aperture* elliptic or broadly semicircular, angled above. *Outer lip* convex, thin and sharp. *Basal lip* narrowly rounded and much produced. *Columella* slightly twisted, with a small fold above. *Inner lip* very thin, narrowly reflexed over the upper part of the pillar, leaving usually a narrow umbilical chink, spreading as a very thin glaze over the flattish parietal wall.

Diameter, 5 mm.; height, 10 mm.: aperture, 3 mm. by 5 mm. (type). Proportion of diameter to height, 1 : 2 to 1 : 1·7. Proportion of diameter to height of aperture, 1 : 1·7. Proportion of height of aperture to height of shell, 1 : 2.

Dentition (Suter, T.N.Z.I., xxxvii, 274, f. 6*a*).—Central tooth bicuspid, laterals tricuspid, marginals serrate.

Hab.—Rivers, creeks, and ponds near Christchurch; Greymouth; Pelorus River; Wellington; Toko; Lakes Virginia and Westmere, near Wanganui; pond near Lake St. John, Auckland.

Remarks.—A very variable species, but always characterized by the spiral liræ and the effuse basal lip, also by the bristles on the carina.

Subsp. conferta, Suter, 1905. Plate 24, figs. 20, 20*a*.

Isidora lirata conferta, Suter, T.N.Z.I., xxxvii, 1904 (1905), 275, f. 7, 8 (reversed); xxxviii, pl. 19, f. 7, 8.

Shell globosely ovate, sinistral, corneous-translucent, thin, almost imperforate. *Sculpture* consisting of microscopic fine regular and close spiral liræ, with distant lines of growth, which on the upper whorls are rather equidistant. *Colour* very light horny to light olive-brown. *Spire* short, broadly conic, about half the height of the aperture. *Protoconch* acuminate, of darker colour, consisting of 2 whorls with fine incremental striation. *Whorls* 4, either strongly shouldered or having only a posterior angle, which usually gets lost on the body-whorl; the latter forms the greater part of the shell, is ventricose and convex; base rounded. *Suture* impressed. *Aperture* vertical, elongately oval, acuminate above and produced anteriorly. *Outer lip* regularly rounded, thin and sharp. *Columella* slightly arcuate, with a distinct fold above. *Inner lip* thin, narrowly reflexed over the pillar above, leaving a minute umbilical chink; continued as a thin callosity over the convex parietal wall.

Diameter, 7 mm.; height, 11 mm.: aperture, 4 mm. by 7 mm. Mean proportion of diameter to height, 1 : 1·6. Mean proportion of diameter to height of aperture, 1 : 1·7. Mean proportion of height of aperture to height of shell, 1 : 1·6.

Animal unknown.

Type in my collection.

Hab.—Swamps near Otorohanga, King-country (type); Wairau River, south of Birch Hill Station, Nelson (E. Suter).

Remarks.—This subspecies is distinguished from the species by its ventricose form and the much broader aperture, approaching *S. tabulata*, Gould.

4. Isidora novæ-zelandiæ, Sowerby, 1873. Plate 24, fig. 21.

Physa novæ-zelandiæ, Sow., Conch. Icon., xix, f. 29; Hutton, M.N.Z.M., 30. *Isidora novæ-zelandiæ*, Sow.: Suter, T.N.Z.I., xxxvii, 273, f. 4 (reversed); xxxviii, pl. 19, f. 4.

Shell moderately large, oval, imperforate or narrowly rimate, whorls angled or smooth, thin and fragile. *Sculpture* consisting of inconspicuous growth-lines only. *Colour* chestnut, young shells light brown. *Epidermis* thin and slightly shining. *Spire* but little elevated, conoidal, its height less than half the height of the aperture. *Protoconch* small, pointed. *Whorls* 3 to 4, shouldered or convex, the

last large, ventricose, inversely conical, its periphery flat or convex; base rounded. *Suture* not much impressed. *Aperture* subvertical, oval, angled above. *Outer lip* straight or convex, thin and sharp. *Basal lip* narrowly arched and a little produced. *Columella* oblique, a little arcuate, strongly twisted, and with a prominent fold above. *Inner lip* narrow, somewhat reflexed over the pillar above, sealing up the umbilicus or leaving a narrow chink, spreading over the flattish parietal wall.

Diameter, 12 mm.; height, 17 mm.: aperture, 6·5 mm. by 14 mm. Proportion of diameter to height, 1 : 1·5. Proportion of diameter to height of aperture, 1 : 2·2. Proportion of height of aperture to height of shell, 1 : 1·4.

Animal unknown.

Type in the British Museum.

Hab.—North Island: Kaipara (R. Buddle).

5. Isidora tabulata, Gould, 1848. Plate 24, fig. 22.

Physa tabulata, Gould, P. Bost. S.N.H., ii, 214; U.S. Expl. Exp., xii, 116, f. 136; Hutton, M.N.Z.M., 30. *Aplexa tabulata*, Gld.: Hutton, P.L.S. N.S.W., vii, 67. *Bulinus tabulatus*, Gld.: Hutton, T.N.Z.I., xvii, 57; Hedley and Suter, P.L.S. N.S.W. (2), vii, 627; Suter, J. de Conch., xli, 233. *Isidora tabulata*, Gld.: Suter, T.N.Z.I., xxxvii, 270, f. 1 (reversed); xxxviii, pl. 19, f. 1.

Shell inflated, solid, short, greenish-brown. *Spire* obtuse, rather short, whorls rather square, flattened near the suture; last whorl large, roundly angular. *Aperture* wide, pale within, slightly acuminated. *Inner lip* strong, columellar fold thick, tortuous.

Remarkable for the flatness of the whorls above the angle (Sowerby).

Diameter, 16 mm.; height, 22 mm.: aperture, 8 mm. by 12 mm. Proportion of diameter to height, 1 : 1·4. Proportion of diameter to height of aperture, 1 : 1·5. Proportion of height of aperture to height of shell, 1 : 1·8.

Dentition.—A. H. Cooke, P.Z.S., 1889, 140, f. 4.

Type in the U.S. Nat. Museum, Washington.

Hab.—A mountain-stream, Bay of Islands (Drayton).

I have not seen this species.

Subsp. moesta, H. Adams, 1861. Plate 24, fig. 23.

Physa moesta, H. Ad., P.Z.S., 1861, 144; Hutton, M.N.Z.M., 31. *Aplexa mœsta*, Ad.: Hutton, P.L.S. N.S.W., vii, 67. *Bulinus moesta*, Ad.: Hutton, T.N.Z.I., xvii, 57; Hedley and Suter, P.L.S. N.S.W. (2), vii, 627; Suter, J. de Conch., xli, 233. *Isidora tabulata moesta*, Ad.: Suter, T.N.Z.I., xxxvii, 270. *Physa coromandelica*, Dunker, Malak. Blätter, 1862, 150. *Bulinus coromandelicus*, Dkr.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 628; Suter, J. de Conch., xli, 233.

Shell ovate, thin and fragile, imperforate; the whorls usually shouldered, but sometimes convex. *Sculpture* consisting of very fine growth-lines only. *Colour* olive-brown to chestnut. *Epidermis* thin,

not shining. *Spire* elevated conic, its height about two-thirds that of the aperture. *Protoconch* minute, pointed. *Whorls* 5, usually broadly shouldered, the shoulder sloping, but sometimes convex; body-whorl large, somewhat inflated, rounded at the periphery; base narrowed. *Suture* not much impressed. *Aperture* oblique, ovate, angled above. *Outer lip* convex, thin and sharp. *Basal lip* narrowly arched and slightly effuse. *Columella* oblique, twisted, slightly arcuate. *Inner lip* thin, reflexed over the columella and closing the umbilicus, spreading over the flattish parietal wall.

Diameter, 11 mm.; height, 17 mm.: aperture, 5 mm. by 10 mm. Proportion of diameter to height, 1 : 1·4 to 1 : 1·8. Proportion of diameter t height of aperture, 1 : 1·9 to 1 : 2·3. Diameter of height of aperture to height of shell, 1 : 1·4 to 1 : 1·7.

Type in the British Museum.

Hab.—Lake Takapuna; Wanganui; Parua Bay, Whangarei; Waikato River, near Huntly; Chatham Islands; Coromandel coast (Hochstetter).

Fam. **ANCYLIDÆ**, Menke.

Animal not spirally coiled; tentacles short and compressed; inferior pallial lobe transformed into a branchia.

Shell non-spiral, conical, limpet-like.

Key to Genera.

A. Shell with an internal posterior horizontal lamina, free and projecting on the right side; present in the young shell .. LATIA.
B. Shell with an internal septum, partly closing the upper part of the shell; absent in the young shell .. .. .. GUNDLACHIA.

Genus 1. Latia, Gray, 1850.

Latia, Gray, P.Z.S., 1849 (1850), 168. Type: *L. neritoides*, Gray. *Pelex*, Gould, 1852.

Animal with the eyes at the outer bases of the tentacles; foot elongated oval; a pulmonary cavity, its opening on the right side; visceral commissure long. There is no jaw. Central tooth of radula bicuspidate, laterals unicuspidate, marginals tricuspidate.

Shell ancyliform, with the apex marginal, and situated at the left posterior side, incurved, small; aperture very large, oval; margin thin and sharp; posteriorly with a narrow, thin, concave lamina, its right edge bent down and free, forming a thin and sharp-edged vertical lamella.

Distribution.—New Zealand only.

In the Index F.N.Z. Hutton says (p. 9) that *Latia* is found fossil in North America. Dr. W. H. Dall kindly supplied the following information: "We have a *Latia*-like species of shell living in Alabama which Pilsbry has named *Amphigyra*. It is probable that our fossil *Latia* is a precursor of this, and not a true *Latia* at all."

Remarks.—This genus is remarkable, being distinguished from the other genera of the family by the situation of the eyes and the absence of a jaw.

1. **Latia neritoides**, Gray, 1850. Plate 24, fig. 24.

Latia neritoides, Gray, P.Z.S., 1849 (1850), 168: J. de Conch., ii, 205, pl. 6, f. 16, 17; v, 84, 167, pl. 3, f. 10, pl. 7, f. 1, 2: Conch. Icon., ix, *Navicella*, pl. 8, f. 34, 35; *Latia*, f. 1, 2: Ad. G.R.M., pl. 84, f. 7. *Pelex lateratis*, Gould, U.S. Expl. Exp., xii, 153, f. 176. *Latia Petitiana*, Fischer, J. de Conch., v. 1856, 84, pl. 3, f. 10. *L. Gassiesiana*, Fischer, *t.c.*, 167, pl. 7, f. 1, 2. *L. neritoides*, Gray: Hedley and Suter, P.L.S. N.S.W. (2), vii, 624; Suter, J. de Conch., xli, 228; T.N.Z.I., xxiii, 93; *t.c.*, xxxvii, 250.

Shell semiovate, thin and fragile, almost smooth, brown, semitransparent. *Sculpture* consisting of microscopic rather distant radiate striæ, and fine dense concentric growth-lines. *Colour* pale to dark brown; interior dark brown in the centre, the lamina white. *Apex* posterior, extending a little beyond the margin, with a spiral nucleus of 1 whorl, visible on the right side; the apex is generally on the left side, but sometimes near the middle of the posterior margin. *Mouth* large, oval, the thin sharp margin generally rounded, but the posterior part of it is occasionally straightened and forming more or less distinct angles with the lateral sides, which themselves may become almost straight. *Inside* polished. The *lamella* has the left attached end near the middle of the left margin, but the right free end does not extend beyond the posterior third of the length of the shell.

Length, 8·5 mm.; breadth, 6 mm.; height, 3 mm.

Animal with ringed filiform tentacles, the eyes at their outer bases (Hutton, T.N.Z.I., xiv, pl. 4, f. U). These animals are highly phosphorescent; this can easily be seen in the dark by disturbing the animals, or by adding a few drops of alcohol to the water (Suter, T.N.Z.I., xxiii, 93).

Dentition (Hutton, T.N.Z.I., xiv, 156, pl. 4, f. E).—The formula of the radula is $30 \times 27 + 1 + 27$. The central tooth is small and bicuspid; laterals increasing in size to the 16th, and then diminishing again, they have first 1, then 2, and near the margin 3 cusps.

Type in the British Museum.

Hab.—North Island of New Zealand, from Whangaroa to Wellington, in lakes, rivers, and creeks, mostly on the under-side of stones.

Remarks.—After examining series of specimens from many localities, I have come to the conclusion that the species described by Gould and Fischer cannot even be upheld as varieties. Many intermediate forms are found, and the characters on which those species were based are too trivial; it is simply a question whether the aperture is more rounded, elongate, or squarish, and the vertex lateral or more median.

Genus 2. Gundlachia, Pfeiffer, 1849.

Gundlachia, Pfr., Zeitschr. für Malak., vi, 1849, 98. Type: *G. ancyliformis*, Pfr.

Animal large; foot oval; tentacles short, compressed, subtruncated at the apex, dilated at the base and outer side; eyes at the inner side of the bases. Jaw filiform. Radula with the central tooth bicuspid, laterals bicuspid, and marginals multicuspidate.

Shell thin, ancyliform, non-spiral, obliquely conical; apex inclined backwards, basal side two-thirds closed with a flat horizontal lamina; aperture anterior, horizontal, semicircular. Young shells without a septum, ancyliform.

Distribution.—America, Antilles, Australasia. It is an inhabitant of fresh-water streams and ponds.

Fossil in the Tertiary.

Key to Species.

A. Shell conical, oval, sides convex, apex at the posterior third of length .. .. *Lucasi.*
B. Shell depressed conoidal, oblong, sides subparallel, apex at the posterior sixth of length .. .. *neozelanica.*

1. Gundlachia Lucasi, Suter, 1905. Plate 24, fig. 25.

Gundlachia Lucasi, Suter, T.N.Z.I., xxxvii, 1904 (1905), 250, f. 10, 10*a*.

Shell obliquely conical, thin, semitransparent, horn-colour, covered by a blackish coating. *Apex* inclined to the right, situated at the posterior third of the length; convex anteriorly, slightly concave on the posterior slope; a few concentric lines of growth. *Aperture* oval; peritreme sharp, extremely fragile. The shells hitherto obtained have no *septum*, being in the *Ancylus* stage of development only.

Length, 3 mm.; breadth, 2 mm.; height, 1 mm. Length, 4 mm.; breadth, $2\frac{3}{4}$ mm.; height, $1\frac{1}{2}$ mm.

Dentition and *jaw* the same as in the next species.

Type in my collection.

Hab.—Lake Waikare (K. Lucas); Inglewood.

2. Gundlachia neozelanica, Suter, 1905. Plate 24, figs. 26, 26*a*.

Gundlachia neozelanica, Suter, T.N.Z.I., xxxvii, 1904 (1905), 258. *Ancylus* sp., Suter, J. de Conch., xl, 1892, 248. *Ancylus tasmanicus*, T.-Woods: Suter, P.L.S. N.S.W. (2), vii, 624; not of T.-Woods. *Gundlachia* sp., Suter, T.N.Z.I., xxvi, 122, pl. 14, f. 1–5 (jaw and teeth cf radula); Suter, P.L.S. N.S.W. (2), viii, 486; Hedley, *l.c.*, 505, 507, 511, pl. 24, f. 12–15; Suter, J. de Conch., xli, 229.

Shell depressed conoidal, oval-oblong, the sides straightened, subparallel, thin, semitransparent, horn-colour, with a blackish-green coating. *Apex* a little inclined to the right, situated at the posterior sixth of the length, flatly convex anteriorly; concentric lines of growth at regular intervals. *Interior* light brown, shining. *Aperture*

elongated oval, slightly broadened anteriorly. Specimens have been found with the *septum* partly formed, but not adult.

Length, 3 mm. ; breadth, 2 mm. ; height, $\frac{3}{4}$ mm.

Jaw very minute, filiform, consisting of a single row of small separate imbricating plates, oblong in shape and serrate at one end.

Radula having the formula 9 + 5 + 1 + 5 + 9. Central tooth small, with the posterior end of the base broadened, with 2 minute cusps. Laterals bicuspidate ; marginals with 4 cutting-points.

Type in my collection.

Hab.—River Avon, near Christchurch, mostly on *Elodea canadensis*, below the outflow of Horseshoe Lake.

Suborder 2. STYLOMMATOPHORA.

Pulmonata with 2 pairs of tentacles (except the *Athoracophoridæ* and *Vertigo*, which have only a single pair) ; these tentacles are invaginable, and the eyes are borne on the summits of the posterior pair. The male and female genital orifices open into a common vestibule, except in the *Digonopora* (*Vaginulidæ* and *Onchidiidæ*). A suprapedal gland is present in nearly all the groups. With the exception of *Onchidium*, there is no longer a veliger stage in the development ; the embryo is often furnished with a contractile pedal vesicle.

The *Stylommatophora* may be divided into four tribes—the *Hologuatha*, *Agnatha*, *Elasmognatha*, and *Digonopora*.

Tribe 1. HOLOGNATHA.

Jaw simple, without a superior appendage.

Fam. **ZONITIDÆ**, Pilsbry.

Animal having the foot-margin defined by a pedal groove ; tail-gland often present, and sole frequently tripartite. Radula with the marginal teeth narrow, the basal plates elongated, and either unicuspid and thorn-shaped by suppression of side cusps, or bicuspid by elevation of outer on middle cusp.

Shell generally heliciform, sharp-lipped.

The *Zonitidæ* are widely distributed, and appear first in the Carboniferous.

Genus 1. Fretum, Sykes, 1900.

Fretum, Sykes, P. Mal. S., iv, 1900, 140. Type : *Xanina casca*, Gould.
Eurypus, Semper, Philipp. Landmoll., iii, pt. i, 1870, 36 ; not of Kirby.
Aulacopus, Pfeffer ; not of Serville (Coleoptera).

Animal with the shell on the broad back of the foot, which bears on each side a narrow border with several small lappets. The shell-lobes are variable in size, the left divided into 2 small lobes. Concre-

tions of calciferous gland very small; flagellum short; no mucous glands. Shell heliciform, narrowly umbilicated, whorls smooth, the last indistinctly angled.

Distribution.—The type is from the Fiji Islands; a few species are recorded from the Solomon Islands, and three from Norfolk and Phillip Islands.

1. **Fretum novaræ**, Pfeiffer, 1862. Plate 25, figs. 1, 1*a*, 1*b*.

Helix novaræ, Pfr., Mal. Bl., viii, 1862, 148; M.H. Viv., v, 169; Hector, Cat. Land Moll. N.Z., 1873, 13. *Hyalina novaræ*, Pfr.: Hutton, M.N.Z.M., 13; T.N.Z.I., xvi, 205. *Flammulina novaræ*, Pfr.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 644. *Ariophanta novaræ*, Pfr.: Suter, J. de Conch., xli, 283. *Xesta novaræ*, Pfr., Index, 65.

Shell orbicular, depressed, narrowly umbilicated, thin, pellucid, somewhat shining. The only *sculpture* is formed by fine growth-striæ, more pronounced at the suture. *Colour* pale yellowish-horny. *Epidermis* thin, slightly opaque. *Spire* conoidal, about half the height of the aperture. *Protoconch* flatly convex, of $1\frac{1}{2}$ smooth whorls. *Whorls* $4\frac{3}{4}$, rather convex, gradually increasing, the last depressed, not descending, faintly angled at the periphery; base flatly rounded. *Suture* scarcely impressed, narrowly margined below. *Aperture* slightly oblique, lunar, broader than high. *Peristome* simple, straight, margins subconverging. *Columella* short, arcuate, above shortly expanded. *Umbilicus* narrow, open.

Diameter—Maj., 6 mm.; min., $5\frac{1}{3}$ mm.: height, $2\frac{1}{4}$ mm. (type of 4 whorls). Diameter—Maj., $7\frac{1}{2}$ mm.; min., $6\frac{3}{4}$ mm.: height, 4 mm. (specimen of $4\frac{3}{4}$ whorls).

Animal with a very distinct tail-gland; foot tripartite.

Dentition (Suter, T.N.Z.I., xxvi, 130, pl. 18, f. 26, 27).—*Jaw* membranaceous, smooth, lower margin with an indistinct median projection. Formula of *radula* 42+1+42, of which 10 to 20 are laterals. Central tooth long and narrow, unicuspidate; laterals unicuspidate, cutting-point broad, blunt; marginals sinuate, bicuspid.

Type in the K.K. Hofmuseum, Vienna.

Hab.—Bay of Islands, type (Hochstetter); near Lake St. John, Auckland (Musson).

Remark.—The margination of the suture is in some specimens almost obsolete.

Fam. **LIMACIDÆ**, Gray.

Animal elongated, semicylindrical; head retractile; oculiferous tentacles moderate, anterior tentacles short, club-shaped. Mantle shield-like, on the anterior and upper portion of the body; orifice of respiratory sac at the lower part of the mantle, on the right side. Excretory and reproductive apertures on the right side. Foot with or without a posterior mucous gland. Jaw arcuate, without vertical ribs; cutting-edge with a median projection. Central tooth of radula

tricuspid; lateral teeth bi- or tri-cuspid, in the latter case the inner cusp is minute; marginal teeth aculeate, with 1, 2, or 3 cutting-points.

Shell almost completely covered by the mantle, or internal.

Genus 1. Otoconcha. Hutton, 1884.

Otoconcha, Hutt., T.N.Z.I., xvi, 1883 (1884), 199. Type: *Vitrina dimidiata*, Pfr.

Animal limaciform, much too large to withdraw into the shell; mantle rather anterior, broadly expanded over the shell, leaving an elongated central opening; no locomotive disc, nor mucous caudal gland. Jaw distantly furrowed.

Shell very flat, transparent, partly external, of few rapidly increasing whorls; aperture horizontal.

This genus, represented by a single species, is precinctive to New Zealand, but it is still open to question whether it is really distinct from *Vitrinoidea*, Semper, from the Philippines. The external characters all agree with Semper's genus.

1. Otoconcha dimidiata, Pfeiffer, 1853. Plate 25, figs. 2, 2*a*.

Vitrina dimidiata, Pfr., M.H. Viv., iii, 1853, 6; P.Z.S., 1852 (1854), 56; Conch. Icon., xii, Vitrina, pl. 10, f. 72; Cat. Pul. Brit. Mus., 71; Hector, Cat. Land Moll. N.Z., 2; M.N.Z.M., 12. *Helicarion dimidiatus*, Pfr., Nomencl. Hel. Viv., 32; Man. Conch. (2), i, 181, pl. 42, f. 22. *Otoconcha dimidiata*, Pfr.: Hutton, T.N.Z.I., xvi, 199; Hedley and Suter, P.L.S. N.S.W. (2), vii, 634; Suter, J. de Conch., xli, 283; Index, 65. *Vitrinopsis* (*Vitrinoidea*) *dimidiata*, Pfr.: Suter, T.N.Z.I., xxiii, 94. *Vitrinoidea dimidiata*, Pfr.: Suter, *l.c.*, xxiv, 274, 285.

Shell much depressed, periphery ovate, very thin. *Sculptured* with minute arcuate striæ, silky, shining, pale-horn *colour*. *Spire* nearly flat. *Whorls* $2\frac{1}{4}$, which are open beneath, and with a narrow membranous edge. *Aperture* horizontal, as large as the whole shell. *Peristome* simple, with regularly curved margins.

Diameter—Maj., 5 mm.; min., 3·5 mm.: height, 1·25 mm.

Animal limaciform, with an oval anterior visceral hump, containing the shell. *Mantle* smooth. Sides of the long and narrow *foot* with a distinct peripodial groove, and distant oblique grooves above, the whole surface minutely wrinkled. *Colour* yellowish, the mantle mottled with brown, usually with a dark-brown streak on the left anterior part, posterior edge of mantle-slit with a few blackish spots; foot more or less marbled with black or brown, the lateral grooves dark-coloured; margin below the peripodial groove whitish; sole spotted with black. *Tail* long, narrow, sharply angled above, and ending in a fine point. *Sole* narrow, simple. *Genital orifice* behind the right oculiferous tentacle. *Respiratory orifice* in an oval slit on the right anterior side of the mantle.

Length of animal, about 25 mm.

Dentition.—Hutton, T.N.Z.I., xvi. 166, pl. 9, f. Y; pl. 11, f. O; Suter, *l.c.*, xxvi. 131, pl. 18, f. 28; pl. 19, f. 29.

Jaw arcuate, with a projecting rostrum at the cutting-edge, vertically channelled or furrowed by the action of the teeth of the radula; cutting-edge deeply and irregularly denticulated. Sometimes the jaw forms only a narrow ledge with blunt inferior denticulations, being quite worn off by the action of the radular teeth.

Radula with the formula 26+1+26. Central tooth rectangular, tricuspidate, the mesodont long, the side cusps small; lateral teeth about 5, tricuspidate, the mesocone long and oblique; intermediate teeth with only a strong and long mesocone, which becomes gradually shorter, then an ectocone is developed, and finally the base becomes narrow and transverse; an entocone also appears.

Type in the British Museum.

Hab.—North Island: Whangarei (A. Suter); Auckland (Cheeseman); Thames (Adams); Hawke's Bay (Colenso); Forty-mile Bush (H. S.); Wanganui (Murdoch); Wellington (T. W. Kirk). South Island: Kenepuru (McMahon); Dyer's Pass, near Lyttelton (H. S.); Hossack Downs, Canterbury (E. Suter); near Reefton (Cavell); near Lake Te Anau (Dr. Dendy).

Remarks.—When at rest the tail is brought forward beside the visceral hump and head, and the same position is also assumed by *Vitrinoidea*.

Fam. PHENACOHELICIDÆ, Suter,

Charopidæ, Hutton, T.N.Z.I., xvi, 199. *Phenacohelicidæ*, Suter, T.N.Z.I., xxiv, 270; Moellendorff, N.D.M.G., xxxi, 1899, 22.

Animal mostly spirally coiled, heliciform; foot with a peripodial groove, and diagonal lateral grooves; tail with a mucous pore. Jaw generally flatly plaited. The marginal teeth of the radula show all intermediate forms from aculeate to quadrate, but even in the latter case some of the cutting-points are usually very long. Reproductive organs simple.

Shell generally heliciform, flat or elevated, umbilicate or imperforate; peristome acute; aperture without lamellæ; surface smooth or ribbed, seldom hairy.

Distribution.—New Zealand, Tasmania, southern and eastern parts of Australia, Auckland and Campbell Islands, New Caledonia, Carolines, Kerguelen, Seychelles, South Africa, South America, Lord Howe Island.

The New Zealand species belong to what Professor Dendy very appropriately called the "cryptozoic" fauna, living hidden in the bush under rotten logs, bark, dead leaves, and sometimes under stones.

Besides the eleven genera found in New Zealand, the following genera should be included in this family: *Hedleyoconcha*, Pilsbry; *Pilula*, Martens; *Trachycystis*, Pilsbry; and most likely also *Amphidoxa*, Albers.

Synopsis of Genera.

A. Animal and shell spirally coiled, heliciform; shell external.
1. Shell depressed, umbilicated, periphery rounded. Radula: Central and lateral teeth tricuspid; marginals with a mesocone only .. .. .. Phacussa.
2. Shell depressed or trochiform, umbilicated, rarely imperforate, striate or smooth, sometimes hairy. Radula: Central tooth with obsolete ectocones; laterals with a short ectocone; marginals with a mesocone only .. .. Thalassohelix.
3. Shell depressed, openly umbilicated, periphery rounded or angled, radially ribbed. Radula: Central tooth tricuspid; laterals similar, but the ectocone larger; marginals with a broad bifid cusp .. .. Gerontia.
4. Shell orbicular, spire low or flat, umbilicus narrow or closed, radially ribbed, interstices minutely reticulate. Radula: Central tooth tricuspid; laterals bi- or tri-cuspid; marginals with 3 to 5 cutting-points .. .. Allodiscus.
5. Shell globose, very thin, imperforate or perforate, periphery rounded or angled. Radula: Central tooth with a mesocone only; laterals bicuspid, no entocone; marginals with several cusps .. .. Thermia.
6. Shell conoidly globose, sub- or im-perforate, striated, periphery angled. Radula: Central and lateral teeth with a broad blunt mesodont; marginals with several cutting-points, the inner bidentate .. Serpho.
7. Shell similar to that of *Thalassohelix*, sometimes with membranous plaits and processes. Radula: Central tooth narrow, tricuspid; inner laterals without side cusps, outer ones tricuspid; marginals multicuspid Therasia.
8. Shell depressed, narrowly umbilicated, ribbed, periphery convex. Radula: Central tooth narrow, with or without side cusps; laterals bicuspid, no entocone; marginals multicuspid, inner cusp large .. .. Phenacohelix.
9. Shell discoidal, openly umbilicated, periphery rounded, with low spirals and radial lamellæ, points of intersection with hairs. Radula: Central tooth and laterals tricuspid, the ectocone of the latter larger than the entocone: inner marginals with 1 bifid cusp, outer ones with several subequal cusps .. Suteria.
10. Shell globose or depressed, umbilicate or imperforate, usually with few rapidly increasing whorls, smooth or ribbed, periphery convex, keeled in one species. Radula: Central and lateral teeth usually tricuspid; marginals with 3, sometimes 4, cutting-points, often coalescing on the outer teeth .. .. .. Flammulina.

B. Animal limaciform, with subcentral visceral hump; shell small, auriform, thin, covered by the longitudinally slit mantle .. .. Ranfurlya.

Genus 1. Phacussa, Hutton. 1883.

Phacussa, Hutt., T.N.Z.I., xv, 138; xvi, 205. Type: *Zonites* (?) *Helmsi*, Hutt. *Phacussa*, Pilsbry, Man. Conch. (2), ix, 12.

Animal elongated; foot very narrow and long, compressed, not tapering, truncated posteriorly, and with a caudal gland; mantle

slightly reflected; eye-peduncles long and thick, tentacles moderate. Jaw arcuate, with numerous imbricating vertical plaits which usually denticulate the margins. Central and lateral teeth of radula tricuspid; marginal teeth with a long and oblique mesocone, lacking side cusps.

Shell depressed, umbilicated; the spire convex, periphery rounded; whorls striate or with fine ribs; the protoconch smooth; aperture rounded-crescentic; peristome simple.

Distribution.—New Zealand and Tasmania.

KEY TO SPECIES.

A. Shell narrowly perforate or imperforate.
  a. Small; greatest diameter, 6½ mm.; about 8 riblets per millimetre .. .. *hypopolia.*
  aa. Larger; greatest diameter, 8 mm. or more.
    b. With fine thread-like growth-lines .. .. .. *fulminata.*
    bb. With radial riblets, 4–5 per millimetre .. .. *costata.*
B. Shell narrowly umbilicate.
  a. Riblets about 3 per millimetre, umbilicus one-sixth to one-seventh of greatest diameter .. .. .. *Henryi.*
  aa. Riblets about 5–6 per millimetre, umbilicus about one-ninth of greatest diameter .. .. *Helmsi.*

1. Phacussa fulminata, Hutton, 1883. Plate 50, fig. 1.

Zonites (?) *fulminata*, Hutt., T.N.Z.I., xv, 1882 (1883), 138. *Phacussa fulminata*, Hutton, T.N.Z.I., xvi, 206; Suter, P. Mal. S., iii, pl. 15, f. 8; Hedley and Suter, P.L.S. N.S.W. (2), vii, 635; Suter, J. de Conch., xli, 244.

Shell depressed, subperforate or imperforate, finely striated, with numerous brown zigzag bands. *Sculpture* consisting of very fine hair-like and flexuous growth-lines; microscopically decussate. *Colour* pale-horny, with numerous radial zigzag reddish-brown bands on the body-whorl, which show only as irregular radiating bands on the spire-whorls. *Epidermis* thin, membranous, not shining. *Spire* slightly convex, its height about half that of the aperture. *Protoconch* of 1½ flatly convex and smooth whorls. *Whorls* 5½ to 6, slowly increasing, lightly convex, the last regularly rounded at the periphery; base flatly convex, somewhat depressed in the centre. *Suture* well impressed, very narrowly margined below. *Aperture* subvertical, transversely lunately rotund. *Peristome* thin, regularly arched, sharp. *Columella* short, vertical, arcuate. *Inner lip* callous, reflected, completely sealing up the narrow umbilicus in quite adult specimens.

Diameter—Maj., 8·5 mm.; min., 6·8 mm.; height, 5·8 mm. (type). Diameter—Maj., 11·5 mm.; min., 10 mm.; height, 7 mm. (specimen of 6 whorls).

Dentition (Hutton, T.N.Z.I., xvi, 173, pl. 10, f. J).—Formula of radula 20 + 18 + 1 + 18 + 20. Central tooth rectangular, the length nearly three times the breadth; the reflexed portion small, constricted at the sides, the point small. Laterals bicuspid, the inner cusp much larger; inner laterals with the inner side emarginate, the

cutting-point small; the outer laterals with the reflexed portion more oblique and its inner margin straight, the cutting-point moderate. Marginals aculeate, with a long curved point. Jaw as in *P. Helmsi*.

Type in the Canterbury Museum, Christchurch.

Hab.—Stewart Island (T. Kirk); Half-moon Bay, Stewart Island (A. Hamilton).

Subsp. **costata**, Suter, 1899.

Phacussa fulminata costata, Suter, P. Mal. S., iii, 288, pl. 15, f. 9.

This subspecies differs from the species in being always perforate, somewhat larger in size, in being costate, and in having mostly a different colour-pattern. The *sculpture* consists of subequidistant low riblets, 4 to 5 per millimetre, the interstices with minute lines of growth, which are decussated by spiral striæ. *Colour* horny, with broad oblique streaks, rarely zigzag bands of reddish-brown. *Protoconch* microscopically radiately striate. *Suture* not or but faintly margined. *Umbilicus* narrow, deep, partly covered by the reflexed inner lip.

Diameter—Maj., 12 mm.; min., 11 mm.; height, 7 mm.

Animal with a distinct caudal pore.

Dentition (Suter, P. Mal. S., iii, 289).—Jaw the same as in the other species of the genus. Radula has the formula 25 + 15 + 1 + 15 + 25, having 4 more teeth in each transverse row than the species, but otherwise they are very much of the same character. The central tooth is tricuspid, with the side cusps minute; the laterals lack the entocone, the mesocone being large; these are followed by 4 transitional teeth, and there are 21 marginals with an oblique mesocone only.

The *reproductive organs* (Plate 1, fig. 8) are very simple. The male organ is broadest at its distal end; at the outer end the retractor muscle is inserted, and opposite to it the vas deferens enters. The free oviduct is long and cylindrical, and on the side towards the male organ the oblong receptaculum seminis, with a short distal cæcum, takes its origin a little above the vestibule.

Type in my collection.

Hab.—Resolution Island, type (R. Henry); The Nuggets, Port Molyneux (A. Hamilton).

2. **Phacussa Helmsi**, Hutton, 1883. Plate 25, figs. 3, 3*a*, 3*b*.

Zonites (?) *Helmsi*, Hutt., T.N.Z.I., xv, 1882 (1883), 137. *Phacussa Helmsi*, Hutton, T.N.Z.I., xvi, 205; Hedley and Suter, P.L.S. N.S.W. (2), vii, 635; Suter, J. de Conch., xli, 244. *P. Helmsi*, var. *maculata*, Hutt., T.N.Z.I., xvi, 205; Hedley and Suter, *t.c.*, 635; Suter, *t.c.*, 244.

Shell depressed, umbilicated, finely ribbed, rather shining. *Sculpture* consisting of thin, rather distant, retractive, and sinuous radial riblets, 5 to 6 per millimetre, the interstices with a few fine growth-

lines, decussated by much closer spiral microscopic lines. *Colour* horny-brown, sometimes spotted and banded with reddish. *Epidermis* thin, membranous, but lightly shining. *Spire* convex, depressed obtuse. *Protoconch* of $1\frac{3}{4}$ smooth flattish whorls. *Whorls* $5\frac{1}{2}$ to 6, slowly increasing, rounded, broader than high; base convex. *Suture* impressed. *Aperture* oblique, lunately rotund. *Peristome* thin, sharp, regularly arched. *Columella* short, oblique. *Inner lip* scarcely reflected. *Umbilicus* narrow, deep, open, about one-ninth of the greatest diameter of the shell.

Diameter—Maj., 9 mm.; min., 7·5 mm.; height, 5·75 mm. (type).

Animal.—Body elongated, the eye-peduncles long and thick, tentacles moderate; foot very long and narrow, compressed, not tapering, truncated posteriorly, and with a caudal gland; mantle slightly reflected. Colour variable—(*a*) Entirely slate-grey, or reddish-brown; (*b*) upper parts slate-grey, foot yellowish speckled or marbled with grey; (*c*) white with a few black spots, the upper anterior parts of the body, except a pale band on the top of the head, slate-grey. (Hutton.)

Dentition (Hutton, T.N.Z.I., xvi, 172, pl. 10, f. 1; pl. 11, f. W).—Formula of radula 28 + 1 + 28, varying from 26 to 30; laterals 11 or 12. Central tooth rather wedge-shaped, broader behind, the length nearly twice the breadth; the reflexed portion triangular, slightly sinuated at the sides, less than half the length of the base, with a moderate point. Laterals with the base rhomboidal; the inner with the reflexed portion half the length of the base, bicuspid, the inner cusp large with a moderate point, the outer cusp small without a point; outer laterals with the reflexed portion shorter and unicuspid, the point longer, reaching beyond the posterior margin of the base. Marginals aculeate, with a strong curved point, which is most developed in the centre of the marginals. (Hutton.)

Jaw arcuate, not tapering, with 20 to 25 flat plaits, which indent the concave margin.

Type in the Canterbury Museum, Christchurch.

Hab.—South Island: Greymouth, type (R. Helms); Bealey; Dunedin (H. S.); Sadd'e Hill, Taieri (E. Suter); near Lake Te Anau (Dr. Dendy); Te Oneroa, Preservation Inlet (Seymour).

3. Phacussa Henryi, Suter, 1899. Plate 50, fig. 2.

Flammulina (*Phacussa*) *Henryi*, Sut., P. Mal. S., iii, 289, pl. 15, f. 10–13.

Shell subdiscoidal, umbilicated, with depressed spire, light brown, not shining, rather thin, costulate. *Sculpture* consisting of sharp subequidistant radial riblets, about 3 per millimetre, the interstices microscopically decussated by numerous incremental and spiral striæ. *Colour* uniformly light brown, the upper whorls sometimes ornamented with rufous zigzag lines. *Epidermis* thin, membranous. *Spire* low, depressed, conoidal. *Protoconch* of $1\frac{1}{2}$ whorls, faintly microscopically decussate. *Whorls* 5, first slowly and then more rapidly increasing,

convex, periphery of last whorl rounded; base convex. *Suture* impressed. *Aperture* oblique, broadly rotundly lunar. *Peristome* regularly arched, simple, sharp. *Columella* short, oblique, arcuate. *Inner lip* slightly callous, reflexed towards the umbilicus, which is narrow, open, deep, showing 2 volutions.

Diameter—Maj., 10 mm.; min., 8·8 mm.: height, 5·5 mm. Diameter of umbilicus, 1·5 mm.

Animal with peripodial groove and small caudal pore.

Jaw (Plate 1, fig. 7) consisting of numerous vertical, transversely finely striated plaits.

Radula (Plate 1, fig. 7) has the formula 24 + 6 + 1 + 6 + 24. The central tooth has a short heart-shaped reflected portion, with a wide mesocone, not extending to the margin of the basal plate; no side cusps. The admedians have a strong stout mesocone, at first vertical, but becoming ultimately very oblique and directed inwards, and a minute ectocone; then follow 5 transitional teeth with basal plates, increasing in size, with small reflected portion and an aculeate mesocone gradually becoming narrower; finally, there are 19 true marginals, having a small quadrate basal plate, to the inner side of which is attached a long aculeate mesocone with a short projection above.

The *reproductive organs* are built up very much on the same plan as in the other species of the genus.

Type in my collection.

Hab.—Resolution Island, type (R. Henry).

Remarks.—This species is nearest to *P. Helmsi*, but has much more remote costæ and a wider umbilicus. From *P. fulminata costata* it is distinguished by the more distant and sharp riblets, and the much wider umbilicus.

4. Phacussa hypopolia, Pfeiffer, 1853. Plate 25, figs. 4, 4*a*, 4*b*.

Helix hypopolia, Pfr., M.H. Viv., iii, 1853, 68; P.Z.S., 1852 (1854), 148; Conch. Icon., vii, pl. 130, f. 787; Conch. Cab. (2), i, pl. 161, f. 18–20; Man. Conch. (2), ii, 181, 212, pl. 54, f. 15. *Charopa hypopolia*, Pfr., Nomencl. Hel. Viv., 97. *Helix* (*Charopa*) *hypopolia*, Pfr.: Hector, Cat. Land Moll. N.Z., 9. *Patula hypopolia*, Pfr., M.N.Z.M., 6. *Phacussa hypopolia*, Pfr.: Hutton, T.N.Z.I., xvi, 205; Man. Conch. (2), ix, pl. 3, f. 10, 11; Hedley and Suter, P.L.S. N.S.W. (2), vii, 635; Suter, J. de Conch., xli, 243.

Shell depressed globose, narrowly umbilicated, thin, silky, very closely ribbed. *Sculpture* consisting of close, thin, sharp, lightly curved axial riblets, about 8 per millimetre, the interstices with fine growth-striæ, crossed by fine, microscopic, rather indistinct spiral lines. *Colour* horny-cinereous, usually radially banded with brown, the bands sometimes zigzag-shaped on the body-whorl, getting obsolete on the

base. *Epidermis* thin, not shining. *Spire* broadly conoidal, convex, the height not quite equal to that of the aperture. *Protoconch* of $1\frac{1}{2}$ smooth whorls, flattened. *Whorls* $5\frac{1}{2}$, slightly convex, the last not descending, regularly rounded at the periphery; base convex. *Suture* impressed. *Aperture* a little oblique, broadly lunar. *Peristome* simple, straight, acute, regularly arched. *Columella* short, oblique, arcuate. *Inner lip* reflexed above. *Umbilicus* narrow, deep, open, very little hidden by the columellar reflexion.

Diameter—Maj., 6·5 mm.; min., 6 mm.: height, 3·3 mm. (type).

Dentition (Suter, T.N.Z.I., xxiv, 286, pl. 20, f. 2–4).—It does not differ much from that of the type species.

Jaw strongly arcuated, with about 40 to 45 vertical plaits, indenting both margins.

Type in the British Museum.

Hab.—North Island: Auckland (H. S.); Waimarama (A. Hamilton); Hawke's Bay (Colenso); Dannevirke (Brooks); Rusthall, Wanganui (R. Murdoch); Wellington (T. W. Kirk). South Island: Kenepuru (McMahon); Nelson; Kowai Bush (Professor Chilton); near Reefton (Cavell); Hooker Valley (H. S.); west of Mount Cook (Filhol); Fortrose (Miss Rich); Bealey; Dunedin.

Remarks.—Albinos are sometimes found; they are yellowish-white, without any colour-markings.

Genus 2. Thalassohelix, Pilsbry, 1892.

Thalassohelix, Pilsbry, "Nautilus," vi, Sept. 1892, No. 5, 56. Type: *Helix zelandiæ*, Gray. *Thalassia* of Hutton and other New Zealand authors; not *Thalassia*, Albers, 1860; not *Thalassia*, Chevrolat, 1834, a genus of Coleoptera. *Thalassohelix*, Pils., Man. Conch. (2), ix, 12.

Animal with narrow foot bearing a caudal mucous gland with a papilla above it; mantle slightly reflected over the peristome.

Jaw arcuate, with flat plaits.

Dentition: Central tooth with a short mesocone, the ectocones obsolete; laterals with a short ectocone, which disappears on the marginals, leaving a long oblique mesocone only.

Shell umbilicated, rarely imperforate, thin, depressed or trochiform, the periphery acutely keeled, bluntly angled, or rounded; apical whorls most minutely spirally striated or smooth; aperture rather large; lip thin, simple, subreflexed at columella.

Distribution.—New Zealand and Tasmania; perhaps also Australia.

Remarks.—The dentition resembles *Phacussa* in the prominence of the mesocones and obsolescence of ectocones on the marginal teeth, and this peculiarity also serves to distinguish *Thalassohelix* from *Therasia*, the shell of which is of a similar form.

KEY TO SPECIES.

A. Shell imperforate. Microscopically spirally striate, periphery convex .. .. *Laingi.*
B. Shell umbilicate.
a. Shell with distinct radiate riblets.
b. Riblets 2–3 per millimetre, crossed by distant spiral lines .. *igniflua.*
bb. Riblets 6 per millimetre, beset with hairs when fresh, no spiral lines .. .. *ziczag.*
aa. Shell with growth-striæ only.
b. Protoconch of 1½ whorls, microscopically spirally striate; succeeding whorls devoid of spiral sculpture. Periphery acutely angled. Umbilicus very narrow, one-fourteenth of the greatest diameter, which is 6 mm. .. *propinqua.*
bb. Protoconch of 1 whorl, indistinctly microscopically spirally striate, the succeeding whorls with the same sculpture. Periphery keeled. Umbilicus one-ninth of the greatest diameter, which is 9·5 mm. or more .. *zelandiæ.*

1. Thalassohelix igniflua, Reeve, 1852. Plate 50, fig. 3.

Helix igniflua, Rve., Conch. Icon., vii. pl. 128, f. 774. *Thalassohelix igniflua*. Hedley and Suter, P.L.S. N.S.W. (2), vii, 636; Suter, J. de Conch., xli, 256. *Helix lambda*, Pfeiffer, M.H. Viv., iii, 1853, 84; P.Z.S., 1852 (1854), 57; Hector, Cat. Land Moll. N.Z., 9; Hutton, M.N.Z.M., II. *Elæa lambda*, Pfr., Man. Conch. (2), i, 129, pl. 26, f. 25.

Shell subconoidly depressed, umbilicated, thin, with radial riblets and spiral liræ, slightly shining, diaphanous, fulvous. *Sculpture* consisting of distant, oblique, retractive, membranous radiate riblets, 2 to 3 per millimetre, crossed by distant spiral striæ, extending down into the umbilicus, the points of intersection raised into a short bristle; the interstices between the spiral striæ finely microscopically striate. *Colour* fulvous, sometimes chestnut-spotted or with protractive brown zigzag bands, usually broader upon the base. *Spire* subconoidal, rather obtuse, about half the height of the aperture. *Protoconch* of 1½ smooth convex whorls. *Whorls* 5 to 5¾, first slowly increasing, rather convex, the last not descending, obscurely angled at the periphery; base convex. *Suture* impressed. *Aperture* oblique, lunately rotund, within shining. *Peristome* simple, straight, margins convergent. *Columella* oblique, arcuate. *Inner lip* thin, expanded above, extending as a thin white callus over the convex parietal wall. *Umbilicus* moderate, conical, about one-sixth of the greatest diameter.

Diameter—Maj., 13 mm.; min., 11 mm.; height, 7 mm. With the same diameter the height reaches sometimes 9 mm.

Animal (Hutton, T.N.Z.I., xvi, 165). — The mantle subcentral, slightly reflected over the peristome of the shell; tail pointed, with a caudal mucous gland, but no papilla; eye-peduncles approximated at their bases; colour white, with clusters of brown spots and an interrupted brown line round the sides, below which the margin of the foot is striped with brown and white transverse bands; a streak on each side of the head black; sole of the foot mottled with brown.

arranged in irregular transverse bands, which slope backwards and form an obtuse angle in the centre.

Dentition.—Hutton, T.N.Z.I., xiv. 151, pl. 3, f. C, M; pl. 4, f. I.

Jaw arcuate, with rounded ends and distant vertical striæ. It is membranaceous, soft, and pale-horn-coloured. There is no median projection. The striations of the jaw appear to arise from folds in the membrane; it gives the appearance of the jaw being made up of many pieces slightly imbricated.

The *radula* is $\frac{3}{4}$ mm. in breadth, with about 70 nearly straight transverse rows of teeth. The formula is 37 + 1 + 37, with 11 laterals on each side. The central tooth has a single cusp, surmounted by a cutting-point. The laterals are bicuspid, but without an entocone. The outer marginals with much reduced base of attachment, and a long and sharp mesocone.

Type in the British Museum.

Hab.—Rangatira Bush, Temuka (Professor Chilton); Oxford (*ibid.*); Dunedin (Captain Hutton); moa swamp at Hamilton's; Burke's Pass; Dyer's Pass; Riccarton Bush (H. S.); Owaka (Bryant); Springburn (Professor Dendy); Saddle Hill, Taieri (E. Suter).

Remarks.—Hutton mentions Napier as habitat, but that is evidently a mistake. According to my experience, the species is restricted to the southern half of the South Island.

Subsp. **obnubila**, Reeve, 1852. Plate 50, fig. 4.

Helix obnubila, Rve., Conch. Icon., vii, pl. 130, f. 792; M.H. Viv., iii, 633; Hector, Cat. Land Moll. N.Z., 12. *Nanina* (*Paryphanta*) *obnubila*, Rve. Nomencl. Hel. Viv., 35. *Patula obnubila*, Rve., M.N.Z.M., 9. *Thalassohelix igniflua obnubila*, Rve.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 636; Suter, T.N.Z.I., xxvi, 127. *Helix sigma*, Pfr., M.S. *Discus sigma*, Adams.

Shell smaller than the species, the spire usually much more depressed, and the periphery more distinctly angled. *Sculpture* and *colour* the same as in the species. *Spire* depressed, about one-third the height of the aperture. *Protoconch* smooth. *Whorls* $4\frac{1}{2}$, flatly convex, the last generally distinctly angled at the periphery; base convex. *Suture* distinct. *Aperture* oblique, lunately rotund. *Peristome* thin, simple, and straight. *Columella* oblique, arcuate. *Inner lip* reflexed above. *Umbilicus* moderate, deep, about one-seventh of the greatest diameter.

Diameter—Maj., 9 mm.; min., 8 mm.; height, 5 mm.

Animal and *dentition* the same as in the species.

Type in the British Museum.

Hab. Near Stonyhurst (F. Suter); Riccarton Bush and Dyer's Pass (H. S.); Dunedin (Captain Hutton); Half-moon Bay, Stewart Island (A. Hamilton).

2. Thalassohelix Laingi, Suter, 1905. Plate 25, figs. 5, 5*a*, 5*b*.

Flammulina (*Thalassohelix*) *Laingi*, Sut., J. Mal., xii, 19, pl. 5, f. 1–8.

Shell globosely depressed, semitransparent, smooth, imperforate. *Sculpture* consisting of very fine close-set lines of growth, which are crossed by numerous microscopic spiral liræ, more distinctly visible on the base. *Colour* rufous-horny, whitish round the umbilical region. *Epidermis* thin, slightly shining. *Spire* but little elevated, conoidal. *Protoconch* of 1½ obtuse whorls, which are faintly radiately striate, and show indistinct microscopic spiral lines. *Whorls* 4, the last rapidly increasing, flatly convex, broadly rounded at the periphery, and slightly impressed in the centre of the base. *Suture* impressed. *Aperture* oblique, broadly lunately oval. *Peristome* simple, straight. *Outer lip* rounded; *basal* margin and *inner lip* slightly arched; the latter is strongly callous above and reflexed over the umbilical region; a broad thin callus unites the converging margins. There is no *umbilicus*, not even in the young stage.

Diameter—Maj., 14 mm.; min., 11·5 mm.: height, 9 mm.

Animal of yellowish-brown colour, with a black band and spots on the mantle, distinctly visible through the shell at the periphery. The caudal pore is very distinct, surrounded by a number of roundish papillæ.

Jaw arcuate, thin and fragile, composed of exceedingly fine vertical lamellæ.

Radula (Plate 1, fig. 9) has the formula 28 + 7 + 1 + 7 + 28. The central tooth has a mesocone extending a little beyond the base, and 2 minute ectocones. The lateral teeth are very similar to the central; the transition teeth show the entocone and mesocone fused together into one, a small ectocone being left. The marginals have apparently only the mesocone left, but there is on most teeth a minute ectocone present, which is sometimes split up into two.

Reproductive organs simple. The vas deferens enters the distal end of the sac of the male organ exactly at the place where the retractor muscle is attached; the verge is covered with rugosities of irregular shape.

Type in my collection.

Hab.—Longwood Range, near Otautau, Southland (R. M. Laing).

3. Thalassohelix propinqua, Hutton, 1883. Plate 9, figs. 1, 1*a*. 1*b*.

Thalassia (?) *propinqua*, Hutt., T.N.Z.I., xv, 1882 (1883), 137; xvi, 203. *Gerontia* (*Thalassohelix*) *propinqua*, Hutt.: Pilsbry, Man. Conch. (2), viii, 72, pl. 22. f. 55–57. *Thalassohelix propinqua*, Hutt.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 636. *Flammulina* (*Thalassohelix*) *propinqua*, Hutt.: Suter, J. de Conch., xli, 257.

Shell depressed, striated, narrowly umbilicated, thin, translucid, not shining. *Sculpture* consisting of exceedingly fine and close microscopic spiral striæ on the protoconch, the succeeding whorls rather

strongly striated with oblique flexuous growth-lines. *Colour* pale-horny, with numerous narrow zigzag red bands, which are often broken up into a series of bands. *Spire* convexly conoidal, about two-thirds the height of the aperture. *Protoconch* of 1½ whorls, obtuse. *Whorls* 4 to 5, rather flattened, periphery of last whorl acutely angled; base rounded. *Suture* impressed. *Aperture* oblique, rotundly lunate. *Peristome* thin and sharp, regularly arched, the *outer lip* sometimes a little angled. *Columella* short, oblique, arcuate. *Inner lip* reflected above. *Umbilicus* very narrow and deep, about one-fourteenth of the greatest diameter.

Diameter—Maj., 6 mm.; min., 5 mm.: height, 4 mm. (type).

Dentition.—Hutton, T.N.Z.I., xvi, 169, pl. 10, f. G; pl. 11, f. V.

Jaw arcuate, not tapering, with about 22 flat plaits, which slightly indent the concave margin.

Radula having the formula 19 + 12 + 1 + 12 + 19. Central tooth with a mesocone; the inner laterals like the central tooth, the outer ones bicuspid; outer marginals with an aculeate mesocone only.

Type in the Canterbury Museum, Christchurch.

Hab.—North Island: Auckland (Gillies); Hawke's Bay (Colenso); Otaki Gorge (Preston); Waimarama; Portland Island; Gisborne (A. Hamilton). South Island: Weka Pass, type (Professor Chilton); Southland (G. M. Thomson).

Subfossil, together with moa-bones and egg-shells, near Petane (A. Hamilton).

4. Thalassohelix zelandiæ, Gray, 1843. Plate 25, figs. 6, 6*a*. 6*b*.

Helix (Carocolla) zelandiæ, Gray, Dieff. N.Z., 247; P.Z.S., 1849, 165; Revue Zool., vii, 375; M.H. Viv., i, 81; Conch. Cab. (2), i, pt. 2, 468, pl. 156, f. 3–5; Conch. Icon., vii, pl. 129, f. 780: Hector, Cat. Land Moll. N.Z., 7. *Nanina (Thalassia) zelandiæ*, Gray, Nomencl. Hel. Viv., 47. *Helix zelandiæ*, Gray, M.N.Z.M., 19. *Thalassia neozelanica*, Gray: Hutton, T.N.Z.I., xvi, 203; Man. Conch. (2), ii, 214, pl. 63, f. 63, 64; ix, pl. 3, f. 29. *Thalassohelix zelandiæ*, Gray: Hedley and Suter, P.L.S. N.S.W. (2), vii, 637. *Flammulina (Thalassohelix) zelandiæ*, Gray: Suter, J. de Conch., xli, 254; P.L.S. N.S.W. (2), viii, 488; "Nautilus," vii, 124.

Shell perforated, depressed, turbiniform, pale-horny, pellucid, thin, periphery keeled. *Sculpture* consisting of fine oblique growth-lines, and exceedingly fine close microscopic spiral striæ. *Colour* pale-horny, mostly variegated with rufous streaks and spots, the former sometimes extending over the base. *Epidermis* thin, very slightly shining. *Spire* conoidal, convex, its height about two-thirds that of the aperture. *Protoconch* of 1 whorl, indistinctly microscopically spirally striate. *Whorls* 5, first slowly then more rapidly increasing, flatly convex, the last keeled; base convex. *Suture* not much impressed. *Aperture* lunately ovate, oblique. *Peristome* simple, acute, angled at the periphery. *Columella* short, oblique. *Inner lip* broadly reflexed above. *Umbilicus* narrow and deep, about one-ninth of the greatest diameter of the shell.

Diameter—Maj., 9·5 mm. ; min., 9 mm. : height, 5·5 mm. (type).

Dentition.—Hutton, T.N.Z.I., xvi. 169. pl. 10, f. E ; Man. Conch. (2), ix, pl. 3, f. 27.

Jaw arcuate, flatly plaited, the concave margin indented.

Radula having the formula 35 + 1 + 35, varying from 27 to 40. Laterals about 9, varying from 8 to 10. Central tooth rectangular, the reflexed portion half the length of the base, slightly constricted, and with a moderate point. The inner laterals like the central tooth, but broader and with the outer lobe more marked and notched, the notch getting gradually less outwards. Inner marginals with a long base and a short reflexed portion bearing a long oblique cutting-point on the inner edge and a small cusp on the outer ; outer marginals irregular, the breadth and length about equal, with a long oblique cutting-point. The laterals pass gradually into the marginals, and the cutting-point is longest in the middle of the marginals. (Hutton.)

Type in the British Museum.

Hab.—North Island : Near Auckland (Major Greenwood) ; Great Barrier Island (Osborne) ; Waiheke Island (H. S.) ; Howick ; Maketu (Major Broun) ; Tuakau (S. Bull) ; Mamaku (T. F. Cheeseman) ; Wairangi (A. Suter) ; Mount Pirongia (T. Urquhart) ; Raglan (R. Murdoch) ; Ngaputahi, Tuhoe-land (A. Hamilton) : Mangaone Cave, near Nuhaka (Howard Hill) ; near Wellington (H. S.). South Island : Nelson (H. B. Preston) ; Kenepuru (McMahon) : Greymouth (R. Helms). Chatham Islands.

5. Thalassohelix ziczag, Gould, 1848. Plate 25, figs. 7, 7*a*, 7*b*.

Helix ziczag, Gould, P. Bost. S.N.H., ii, 166 ; U.S. Expl. Exp., xii, 41, f. 44, *a–c* ; M.H. Viv., i, 11 ; Cox, Monogr. Aust. Land Shells, 18, pl. 19, f. 11, 11*a* ; Man. Conch. (2), ii, 210, viii, 69. *Patula* (*Discus*) *ziczag*, Gld., Nomencl. Hel. Viv., 91 ; M.N.Z.M., 7. *Thalassohelix ziczag*, Gld. : Hedley and Suter, P.L.S. N.S.W. (2), vii, 635 ; Suter, *l.c.* (2), viii, 488 ; "Nautilus," vii, 123 ; J. de Conch., xli, 256. *Helix Portia*, Gray, P.Z.S., 1849 (1850), 165 ; A.M.N.H. (2), vii, 65 ; M.H. Viv., iii, 154 ; Conch. Icon., vii, f. 806 ; Conch. Cab. (2), i, pt. 2, 213, pl. 154, f. 15–18 ; Man. Conch. (2), ii, 213, pl. 62, f. 35–37. *Patula* (*Charopa*) *Portia*, Gray, Nomencl. Hel. Viv., 98. *Helix* (*Charopa*) *Portia*, Gray : Hector, Cat. Land Moll. N.Z., 18. *Patula Portia*, Gray, M.N.Z.M., 10. *Thalassia Portia*, Gray : Hutton, T.N.Z.I., xvi, 203. *Helix collyrula*, Reeve, Conch. Icon., f. 811. *H. kappa*, Pfeiffer, P.Z.S., 1852 (1854), 58 ; M.H. Viv., iii, 154 ; Conch. Cab. (2), i, pt. 2, pl. 154, f. 25, 26. *H.* (*Charopa*) *kappa*, Pfr. : Hector, Cat. Land Moll. N.Z., 18. *Patula* (*Charopa*) *kappa*, Pfr., Nomencl. Hel. Viv., 98. *P. kappa*, Pfr., M.N.Z.M., 7.

Shell depressed, umbilicated, thin, ribbed, and hairy, periphery convex. *Sculpture* consisting of obliquely retractive, arcuate, equidistant, fine and sharp axial riblets, about 6 per millimetre, with sparse rigid hairs, which easily get rubbed off ; there is no spiral sculpture. *Colour* fulvous, with rufous streaks and spots, the former forming zigzag lines on the last whorl, obsolete on the base. *Epidermis*

thin, horny, easily peeling off, not shining. *Spire* convex, conoidal, scarcely half the height of the aperture. *Protoconch* flat, of $1\frac{3}{4}$ smooth whorls. *Whorls* $5\frac{1}{2}$, rather convex, regularly increasing, the last not descending, with rounded periphery; base convex. *Suture* deep. *Aperture* oblique, rotundly lunar. *Peristome* simple, thin and sharp, regularly arched, the upper part arcuately protracted below the insertion. *Columella* short, somewhat oblique, arcuate. *Inner lip* slightly callous, shortly reflexed, spreading as a very thin white glaze over the convex parietal wall. *Umbilicus* moderate, somewhat perspective, deep, its diameter about one-sixth of the greatest diameter of the shell.

Diameter—Maj., 8 mm.; min., 7 mm.: height, 4 mm.

Dentition.—Hutton, T.N.Z.I., xvi, 165, pl. 9, f. T; Man. Conch. (2), ix, pl. 3, f. 28.

Jaw arched, not tapering, with about 34 flat plaits.

Radula has the formula 24 + 1 + 24; laterals about 9. The central tooth rather wedge-shaped, the reflexed portion triangular, with a small point. Laterals rather oblique, broader than the central, the reflexed portion bicuspid with a long point on the inner cusp; they pass gradually into the marginals, which are rather broader than long, with a long cutting-point and a small one on each side of it. (Hutton.)

Type in the U.S. Nat. Museum, Washington.

Hab.—North Island: A crater near Taiaimi, type (Pickering); Parua Bay, Whangarei; Hillyer's Creek, near Auckland; Mount Wellington (Musson); Waiheke Island (H. S.); Waiwera; Swanson; Waitakerei Range (H. S.); Hunua Range; Tarukenga (Major Broun); Tuakau (S. Bull); Ngaputahi, Tuhoe-land (A. Hamilton); Ruatahuna, Tuhoe-land (E. Best).

Remark.—Erroneously reported from Australia.

Genus 3. Gerontia. Hutton, 1883.

Gerontia, Hutt., T.N.Z.I., xv, 1882 (1883), 135. Type: *G. pantherina*, Hutton. *Gerentia* (typog. err.), in N.Z.J.S., i, 476. *Gerontia*, Hutt.: Pilsbry, Man. Conch. (2), ix, 14.

Animal heliciform; mantle rather posterior, included; tail acute, with a mucous pore, but no papilla.

Jaw vertically plaited.

Central tooth of radula tricuspid, cusps with moderate cutting-points. Laterals similar, but the ectocones larger than the entocones; transition teeth bicuspid by fusion of entocone with mesocone. Marginals with a broad bifid cusp.

Shell depressed and openly umbilicated, having a contour of *Patula;* thin, rather fragile, the surface delicately sculptured with fine cuticular riblets; apical whorl minutely granular, or showing a few weak spirals, having a minute perforation at the tip.

The shell is like a thin *Selenites* with delicate close riblets. It is more broadly umbilicated than in the other genera of this family.

Distribution.—New Zealand.

KEY TO SPECIES.

A. Shell with coarse growth-striæ, marbled and streaked with brown; periphery convex .. .. *Cordelia.*
B. Shell with oblique membranous radial riblets, colour green-corneous; periphery obtusely angled above .. .. *pantherina.*

1. Gerontia Cordelia, Hutton, 1883. Plate 25, figs. 8, 8*a*, 8*b*.

Gerontia Cordelia, Hutt., N.Z.J.S., i, 1883, 476; T.N.Z.I., xvi, 178, 200; Pilsbry, Man. Conch. (2), viii, 66, pl. 22, f. 34–36; Hedley and Suter, P.L.S. N.S.W. (2), vii, 637. *Flammulina* (*Gerontia*) *Cordelia*, Hutt.: Suter, J. de Conch., xli, 243.

Shell subdiscoidal, widely umbilicated, striated, thin. *Sculpture* consisting of rather crowded and coarse growth-striæ, with traces of fine microscopic spiral lines on the protoconch. *Colour* pale-horny, marbled and streaked with reddish-brown. *Epidermis* thin, yellow, shining. *Spire* convex, about half the height of the aperture. *Protoconch* of $1\frac{1}{2}$ whorls, with a small shallow perforation at the middle. *Whorls* $4\frac{1}{2}$, slowly increasing, rounded, periphery convex. *Suture* impressed. *Aperture* slightly oblique, subcircular. *Peristome* thin and sharp. *Outer lip* lightly descending. *Columella* slightly oblique, almost straight. *Inner lip* very little reflexed. *Umbilicus* broad, conical, showing all the whorls, about one-quarter of the greatest diameter.

Diameter—Maj., 8 mm.; min., 6·75 mm.: height, 4·5 mm.

Animal unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—Titirangi, Auckland, type (T. F. Cheeseman); Bay of Islands.

Remarks.—I place this species in *Gerontia* from the general appearance of the shell, but I do not know the animal nor the dentition. It differs from *G. pantherina* in being more convex, in the epidermis not being plaited, in being more coarsely striated, in the right margin descending, in the aperture being less oblique, and in its colours. (Hutton.)

2. Gerontia pantherina, Hutton, 1883. Plate 25, figs. 9, 9*a*, 9*b*.

Gerontia pantherina, Hutt., T.N.Z.I., xv, 1882 (1883), 135; xvi, 200: Pilsbry, Man. Conch. (2), viii, 65, ix, pl. 3, f. 1–3: Hedley and Suter, P.L.S. N.S.W. (2), vii, 637; Suter, J. de Conch., xli, 243.

Shell subdiscoidal, broadly umbilicated, thin, pellucid, striated. *Sculpture* consisting of close but irregular oblique radial riblets, which are membranous on the upper surface, fine and hair-like on the base; there are about 8 to 10 per millimetre; the interstices with numerous

fine growth-lines and inconspicuous dense microscopic spiral striæ, which, however, are only visible with a magnifying-power of about 50 diameters. *Colour* horny-brown, the last whorl usually of a lighter colour, green-corneous. *Epidermis* thin, faintly shining. *Spire* depressed, slightly convex, not quite half the height of the aperture. *Protoconch* flattish, of 1½ whorls, finely radially and microscopically spirally striate. *Whorls* 4½, slowly increasing, lightly convex, the last not descending in front, obtusely angled at the shoulder. *Suture* deep. *Aperture* oblique, round-lunar. *Peristome* thin and simple, advancing above. *Columella* short, oblique, arcuate. *Inner lip* very little reflected above. *Umbilicus* broad and deep, about one-quarter of the greatest diameter.

Diameter—Maj., 9·5 mm.; min., 8·25 mm.: height, 4 mm. to 4½ mm.

Animal.—Top of the head yellow; peduncles and a line on each side of the head black; rest of the body pale grey spotted with dark grey, the spots often collected into groups; a regular line of dark-grey spots runs along each side, and they meet on the tail just over the mucous pore; below this line the side of the foot is marked with oblique dark stripes; sole white, the margin with grey spots.

Dentition.—Hutton, T.N.Z.I., xvi, 166, pl. 9, f. 1; pl. 11, f. R: Man. Conch. (2), ix, pl. 2, f. 4, 5.

Jaw slightly arcuated, with numerous narrow vertical plaits.

Radula (Plate 1, fig. 10) having the formula 24 + 1 + 24; laterals 8 or 9. Central tooth tricuspid, the median cusp reaching the posterior margin; all cusps with moderate cutting-points. Laterals similar to the central, the transition teeth bicuspid. Marginals longer than broad, with a broad bidentate point.

Type in the Canterbury Museum, Christchurch.

Hab.—Greymouth, type (R. Helms); Capleston and Reefton (Cavell).

Genus 4. Allodiscus, Pilsbry, 1892.

Allodiscus, Pilsbry, "Nautilus," vi, Sept. 1892, 56. Type: *Helix dimorpha*, Pfeiffer. *Psyra*, Hutton, T.N.Z.I., xvi, 1884, 201; not of Stal, 1876, a genus of Orthoptera. *Allodiscus*, Pils., Man. Conch. (2), viii, 66; ix, 14.

Animal with the mantle subcentral; tail truncated, with a mucous gland below a papilla; eye-peduncles thick, approximated at their bases.

Jaw slightly arcuate, not tapering toward the ends, flatly ribbed or plaited.

Dentition: Central tooth with tricuspid reflection, mesocone long. Lateral teeth bicuspid, the entocone being suppressed, or tricuspid. Marginal teeth broad, with 3 to 5 cutting-points.

Shell thin, orbicular, and depressed, with low or flat spire, rounded periphery, and narrow subimperforate or quite closed umbilicus: surface radially rib-striated, minutely reticulated, not hairy, the

embryonic $1\frac{1}{2}$ whorls spirally striated; aperture crescentric, scarcely oblique; peristome thin, shortly reflexed at the columella; parietal wall nude.

Distribution.— New Zealand, Tasmania, Australia.

Remarks.—The genus *Monomphalus*, Ancey, 1882, from New Caledonia, is very similar in shell-characters, and the two may require to be united. However, the anatomy of the New Caledonian forms is unknown, and may prove sufficiently different. (Pilsbry.)

KEY TO SPECIES.

A. Shell imperforate.
  a. Spire-whorls with sharp riblets, body-whorl plaited or striated with growth-lines; spire one-third the height of aperture; shell 14·5 mm. by 10 mm. .. .. *Cassandra.*
  aa. All whorls, except protoconch, radially costate.
    1. Costæ 4 per millimetre; spire one-fourth the height of aperture; shell 10·5 mm. by 7 mm. .. .. *dimorphus.*
    2. Costæ 5–6 per millimetre; spire half the height of aperture; shell 6 mm. by 3 mm. .. .. *venulatus.*
    3. Costæ 6–7 per millimetre; spire one-third the height of aperture; shell 7 mm. by 4 mm. .. .. *Cooperi.*
    4. Costæ 8 per millimetre; spire half the height of aperture; shell quite white, 5 mm. by 3 mm. .. *chion.*
    5. Costæ 12 per millimetre; spire one-third the height of aperture; shell 4·5 mm. by 2 mm. .. .. *Tullia.*

B. Shell narrowly umbilicate or perforate.
  a. Costæ about 20 per millimetre on the whorls succeeding the protoconch, increasing to 40 and 50 on the last two whorls; shell 4 mm. by 3 mm. .. .. .. *granum.*
  aa. Costæ nearly equidistant on all whorls.
    1. Costæ 7 per millimetre; spire one-third the height of aperture; perforation narrow, sometimes partly covered; shell 3·25 mm. by 2 mm. .. .. *wairouensis*
    2. Costæ 8 per millimetre, oblique, retractive; spire one-fourth the height of aperture; perforation open, one-tenth of greatest diameter; shell 5 mm. by 2·5 mm. .. .. *rusticus.*
    3. Costæ 8–9 per millimetre; spire dome-shaped, half the height of aperture; perforation almost quite closed; shell 4·5 mm. by 3·2 mm. .. .. .. *tholoides.*
    4. Costæ 9 per millimetre, straight; spire flat, but little raised; perforation open, one-tenth of greatest diameter; shell 4·5 mm. by 2·5 mm. .. .. *Godeti.*
    5. Costæ 10 per millimetre; spire half the height of aperture; perforation narrow, $\frac{1}{3}$ mm., open; shell 5 mm. by 2·8 mm. .. .. *Mossi.*
    6. Costæ 20–25 per millimetre; perforation narrow, sometimes partly covered.
      a. Spire slightly elevated, two-thirds the height of aperture; shell 4 mm by 1·75 mm. .. *Adriana.*
      aa. Spire more depressed, one-quarter the height of aperture; shell 3·75 mm. by 2 mm. .. *planulatus.*
    7. Costæ 25 per millimetre; spire quite flat: perforation narrow, open; shell 2·25 mm. by 1·25 mm. .. *Smithi.*
    8. Costæ 40 per millimetre; spire half the height of aperture; umbilicus one-sixth of greatest diameter, open; shell 1·5 mm. by 1 mm .. .. .. *Urquharti*

1. Allodiscus Adriana, Hutton, 1883. Plate 25, figs. 10, 10*a*, 10*b*.

Fruticicola Adriana, Hutt., N.Z.J.S., i, 1883, 476; T.N.Z.I., xvi, 175. *Psyra Adriana*, Hutt., *t.c.*, 201. *Gerontia* (*Allodiscus*) *Adriana*, Hutt.: Pilsbry, Man. Conch. (2), viii, 67. *Allodiscus Adriana*, Hutt.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 639. *Flammulina* (*Allodiscus*) *Adriana*, Hutt.: Suter, J. de Conch., xli, 252; Man. Conch. (2), ix, 15.

Shell small, discoidal, perforated, finely ribbed, thin, not shining. *Sculpture* consisting of delicate fine flexuous radial riblets, 20 to 25 per millimetre, absent on the embryonic whorls, but extending on the base to the perforation; interstices with fine growth-lines, reticulated by microscopic spiral lines, which are also visible on the protoconch. *Colour* pale corneous with spots and angular streaks of chestnut, absent upon the base. *Epidermis* thin, membranous, not shining. *Spire* flatly convex, about two-thirds the height of the aperture. *Protoconch* of $1\frac{1}{2}$ to $1\frac{3}{4}$ whorls, the nucleus slightly raised. *Whorls* $4\frac{1}{2}$, slowly increasing, convex, periphery regularly rounded; base convex, with a central depression. *Suture* impressed. *Aperture* slightly oblique, rotundly lunar. *Peristome* thin, regularly arched. *Columella* very short and oblique. *Inner lip* slightly reflected. *Perforation* narrow and open, somewhat hidden by the reflection of the peristome.

Diameter—Maj., 4 mm.; min., 3·5 mm.; height, 1·75 mm. (type).

Animal unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—North Island: Cape Maria van Diemen (McGahey); Mount Pirongia (T. Urquhart); Mount Egmont, 3,000 ft. to 4,500 ft., and Toko, near Stratford (R. Murdoch); Otaki Gorge (H. B. Preston); Napier; Forty-mile Bush (H. S.); Shannon, Manawatu (R. Murdoch); Ormondville (Chadwick). South Island: Banks Peninsula, type (R. Brown); Springburn (Professor Dendy); Governor's Bay (H. S.).

The species is nowhere common.

2. Allodiscus Cassandra, Hutton, 1883. Plate 9, figs. 2, 2*a*, 2*b*.

Charopa (?) *Cassandra*, Hutt., N.Z.J.S., i, 1883, 476; T.N.Z.I., xvi, 181. *Psyra Cassandra*, Hutt., *t.c.*, 201. *Gerontia* (*Allodiscus*) *Cassandra*, Hutt.: Pilsbry, Man. Conch. (2), viii, 66, pl. 22, f. 37–39. *Allodiscus Cassandra*, Hutt.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 638. *Flammulina* (*Allodiscus*) *Cassandra*, Hutt.: Suter, J. de Conch., xli, 251; Pilsbry, Man. Conch. (2), ix, 15.

Shell rather large, depressed, imperforate, thin and fragile. *Sculpture* of protoconch consisting of microscopic radial and close spiral lines; the following two or three whorls are radially distinctly ribbed, the ribs first close together but gradually becoming more distant and less prominent until on the last whorl there are only well-marked close and flexuous growth-lines; the interstices between the riblets with numerous close and fine growth-striæ, crossed by fine and dense microscopic spiral lines. *Colour* corneous, with radially angulated bands of chestnut. *Epidermis* thin, membranous, but faintly shining.

Spire conoidal, depressed, obtuse, about one-third the height of the aperture. *Protoconch* of 1½ flattish whorls. *Whorls* 5½, first slowly then more rapidly increasing, convex, periphery rounded; base flatly convex, slightly depressed at the middle. *Suture* impressed. *Aperture* oblique, rotundly lunate. *Peristome* acute, straight. *Outer lip* regularly arched. *Basal lip* straightened. *Columella* oblique, slightly excavated. *Inner lip* callous, broadly reflexed over and completely sealing up the umbilicus, spreading as a thin white glaze over the convex parietal wall.

Diameter—Maj., 14·5 mm.; min., 12·5 mm.: height, 10 mm.

Animal unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—Big King, Three Kings Islands (T. F. Cheeseman, Captain Bollons).

Remark.—The locality Napier, as stated by Hutton, is wrong.

3. Allodiscus chion, Sykes, 1896. Plate 25, figs. 11. 11*a*, 11*b*.

Flammulina (*Allodiscus*) *chion*, Sykes, P. Mal. S., ii, 1896, 107, figs. in text.

Shell small, depressed conical, imperforate, thin, translucent, white. *Sculpture:* Protoconch microscopically distinctly spirally striate, the succeeding whorls with fine, subequidistant, sharp, obliquely protractive riblets, about 8 per millemetre, the interstices with fine growth-lines reticulated by microscopic spiral liræ. *Colour* uniformly white. *Epidermis* transparent, but very little shining. *Spire* conoidal, convex, about half the height of the aperture. *Protoconch* of 2 convex whorls. *Whorls* 5 to 5½, convex, regularly increasing, the last not descending; base convex, impressed at the middle. *Suture* rather deep. *Aperture* oblique, rotundly lunate. *Peristome* simple, thin and sharp, broadly arched. *Columella* short, oblique, arcuate. *Inner lip* lightly callous, reflexed, spreading broadly as a very thin smooth callosity over the convex parietal wall. There is no trace of an *umbilical perforation*.

Diameter—Maj., 5 mm.: height, 3 mm.

Animal unknown.

Type in Mr. E. R. Sykes's collection; *co-type* in my collection.

Hab.—Near Inglewood, Taranaki (H. B. Preston).

Remarks.—The nearest species appears to be *A. renulatus*, Pfr., from the South Island; from this, however, *A. chion* may be separated by the difference in the relative proportions of breadth and height, as also by the more distant and more elevated riblets. The entire absence of colour is also a remarkable feature.

4. Allodiscus Cooperi, Suter, 1907. Plate 11, fig. 5, 6, 7.

Flammulina (*Allodiscus*) *Cooperi*, Sut., P. Mal. S., vii, March, 1907, 237, pl. 22, f. 5–7.

Shell small, orbicular, costate, imperforate, and with broad zigzag streaks. *Sculpture* consisting of close and sharp radial costæ, very

little sinuous, 6–7 per millimetre; interstices with very fine incremental lines, which are crossed by indistinct fine microscopical spiral striæ; the latter sculpture is also present on the protoconch. *Colour* fulvous, with broad distinct chestnut radiate streaks on the upper part of the whorls, forming anastomosing zigzag lines on the periphery and base. *Epidermis* thin, not shining. *Spire* low, broadly convex, about one-third the height of the aperture. *Protoconch* of $1\frac{1}{2}$ smooth convex whorls. *Whorls* $4\frac{1}{2}$, regularly increasing, convex, periphery sharply rounded; base flatly convex. *Suture* very distinct and well impressed. *Aperture* oblique, lunate. *Columella* oblique, a little concave. *Inner lip* lightly callous, reflexed over the not much impressed umbilical tract, and spreading broadly as a thin white callosity over the convex parietal wall. *Umbilicus* completely closed in adult specimens.

Diameter—Maj., 7 mm.; min., 6·2 mm.: height, 4 mm. (type).

Animal unknown.

Type in my collection.

Hab.—Poor Knights Islands (C. Cooper).

Remark.—This species stands nearest to *A. dimorphus*, but is distinguished from it by its much smaller size and the closer riblets.

5. Allodiscus dimorphus, Pfeiffer, 1853. Plate 50, fig. 5.

Helix dimorpha, Pfr., M.H. Viv., iii, 1853, 68; P.Z.S., 1852 (1854), 148; Conch. Icon., vii, pl. 128, f. 775. *H.* (*Charopa*) *dimorpha*, Pfr.: Hector, Cat. Land Moll. N.Z., 8; Nomencl. Hel. Viv., 97. *Patula dimorpha*, Pfr., M.N.Z.M., 6. *Psyra dimorpha*, Pfr.: Hutton, T.N.Z.I., xvi, 201. *Charopa* (*Psyra*) *dimorpha*, Pfr., Man. Conch. (2), ii, 211, pl. 62, f. 39. *Allodiscus dimorphus*, Pfr.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 638. *Flammulina* (*Allodiscus*) *dimorpha*, Pfr.: Suter, J. de Conch., xli, 250; Man. Conch. (2), ix, 15.

Shell depressed, imperforate, thin, radially striated, diaphanous, a little shining. *Sculpture:* The protoconch is microscopically radially wrinkle-striate, with obscure spiral liræ; succeeding whorls rather distantly radially costate, about 4 riblets per millimetre: they are subequidistant, thread-like, slightly sinuous, extending over the base; interstices with about 10 fine growth-lines, crossed by microscopic very dense spiral striæ. *Colour* pale-horny, minutely rufously tessellated by zigzag lines, and at the suture ornamented with rufous spots. *Epidermis* thin, membranous. *Spire* scarcely elevated, flatly convex, about one-quarter the height of the aperture. *Protoconch* of $1\frac{3}{4}$ convex whorls, quite flat. *Whorls* $4\frac{1}{2}$ to 5, rather convex, the last not descending, higher than broad; base flattish. *Suture* broadly impressed. *Aperture* subvertical, lunar. *Peristome* simple, straight, with the basal margin somewhat bent backwards. *Columella* short, very oblique, a little arcuate. *Inner lip* callously reflected above, spreading broadly as a thin bluish-white callosity over the convex parietal wall. The free reflection of the inner lip forms a shallow *false perforation*.

Diameter—Maj., 8·5 mm.; min., 7·5 mm.: height, 5 mm. (type). Diameter—Maj., 10·5 mm.; min., 9·5 mm.: height, 7 mm. (large specimen).

Dentition.—Hutton, T.N.Z.I., xvi. 161. pl. 9. f. V.

Jaw slender, slightly arcuated, with about 35 flat plaits, which indent both margins.

Radula (Plate 1, fig. 11) having the formula 35+1+35, with 18 laterals in a large specimen. In smaller animals the number of teeth is sometimes as few as 22, with 10 laterals. Central tooth with the base narrower in front, longer than broad; reflexed portion narrow, two-thirds the length of the base, with a minute lateral cusp on each side, the mesocone moderate. Laterals with the inner side of the reflexed portion sinuated, outer side with a short broad emarginate process; the cutting-points longer than on the central tooth. Marginals at first longer than broad, but near the margin broader than long, the inner with a bidentate point; the outer also with a bidentate point, and one or two smaller ones outside it.

Type in the British Museum.

Hab.—North Island: Hokianga (McMahon); Waitakerei Range (H. S.); Thames (Adams); near Auckland (Gillies); Ohaupo (Musson); Tirau (Smale); Upper Waitotara; Great Barrier Island (Osborne); Toko, near Stratford (R. Murdoch); Dannevirke (Brooks); Forty-mile Bush (H. S.); Wellington (T. W. Kirk). South Island: Milford Sound (Professor Dendy).

6. Allodiscus Godeti, Suter, 1891. Plate 25, figs. 12, 12*a*. 12*b*.

Psyra Godeti, Sut., T.N.Z.I., xxiii. 1890 (1891), 90, pl. 17, f. 8, *a*, *b*, O, P. *Gerontia* (*Allodiscus*) *Godeti*, Sut.: Pilsbry, Man. Conch. (2), viii, 68, pl. 22, f. 43–45. *Allodiscus Godeti*, Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 639. *Flammulina* (*Allodiscus*) *Godeti*, Sut.: J. de Conch., xli. 253; Man. Conch. (2), ix, 15, pl. 2, f. 13, 14 (jaw and radula).

Shell small, discoidal, perforated, radially ribbed, devoid of colour-markings, not shining, semitransparent, thin and fragile. *Sculpture*: Protoconch microscopically finely spirally lirate; succeeding whorls with strong, rather distant, almost straight radial riblets, about 9 per millimetre, extending down to the perforation; interstices with fine growth-lines, reticulated by microscopic close spiral striæ. *Colour* light-horny, without any markings. *Epidermis* thin and membranous. *Spire* flat, very little raised. *Protoconch* of $1\frac{1}{2}$ lightly convex whorls. *Whorls* $4\frac{3}{4}$ to 5, convex, regularly increasing, the last not descending, and its periphery rounded; base roundish. *Suture* impressed. *Aperture* subvertical, lunar, considerably excavated by the penultimate whorl. *Peristome* thin and sharp. The *outer lip* convex; *basal lip* straightened. *Columella* very short and oblique. *Inner lip* slightly callous, but little reflected above, broadly extended over the parietal wall as a very thin white glaze. *Umbilicus* very narrow, about one-tenth of the greatest diameter, quite open.

Diameter, 4·5 mm. ; height, 2·5 mm.

Jaw slightly arcuate, not tapering, flatly plaited, the upper margin indented.

Radula having the formula 14 + 6 + 1 + 6 + 14. Central tooth rectangular, not much longer than broad, reflexed portion tricuspid, the mesocone extending to the posterior margin of the base. Laterals a little broader than the central, bicuspid, the inner cutting-point long, extending beyond the base. Marginals much broader than long, with 4 to 5 cutting-points. The larger cutting-points of the laterals and marginals reach over the next row of teeth.

Type in my collection.

Hab.—South Island : Foot of Sealy Range, Hooker Valley ; under stones (H. S.).

Remarks.—This species is allied to *A. Tullia*, Hutt., but is easily distinguished from it by the absence of colour-markings, the stronger and more distant riblets, and the open perforation. This species is sometimes infested by a *Distoma* (Suter, T.N.Z.I., xxiii, 95, pl. 17, f. 9).

7. Allodiscus granum, Pfeiffer, 1857. Plate 9, fig. 3, *a*, *b*.

Helix granum, Pfr., P.Z.S., 1857, 107 ; M.H. Viv., iv, 20. *H.* (*Thalassia*) *granum*, Pfr. : Hector, Cat. Land Moll. N.Z., 5. *Nanina* (*Thalassia*) *granum*, Pfr., Nomencl. Hel. Viv., 46. *Charopa* (*Thalassia*) *iota granum*, Pfr., Man. Conch. (2), ii, 212. *Helix granum*, Pfr., M.N.Z.M., 20. *Fruticicola pilula granum*, Pfr. : Hutton, T.N.Z.I., xvi, 194. *Phenacohelix granum*, Pfr. : Hedley and Suter, P.L.S. N.S.W. (2), vii, 642. *Flammulina* (*Phenacohelix*) *granum*, Pfr. : Suter, J. de Conch., xli, 249 ; Man. Conch. (2), ix, 16. *Charopa Miranda*, Hutton, N.Z.J.S., i, 1883, 476 ; T.N.Z.I., xvi, 1883 (1884), 180. *Psyra Miranda*, Hutt., *t.c.*, 202. *Gerontia* (*Allodiscus*) *Miranda*, Hutt. : Pilsbry, Man. Conch. (2), viii, 68, pl. 22, f. 40–42. *Allodiscus Mirandus*, Hutt. : Hedley and Suter, P.L.S. N.S.W. (2), vii, 639. *Flammulina* (*Allodiscus*) *Miranda*, Hutt. : Suter, J. de Conch., xli, 252 ; Man. Conch. (2), ix, 15.

Shell very small, turbinately globose, thin, very closely and finely striately ribbed, subperforated. *Sculpture :* The first two whorls succeeding the smooth protoconch are radially ribbed ; riblets about 20 per millimetre ; they are gradually becoming closer and finer, numbering about 40 per millimetre on the penultimate and about 50 on the last whorl ; the interstices with few fine growth-lines, crossed by microscopic dense spiral liræ. *Colour* pale corneous, with broad rufous radial bands on the spire-whorls, minutely tessellated at the periphery and base. *Epidermis* thin, not shining. *Spire* conoidal, slightly acute, about one-third the height of the aperture. *Protoconch* slightly raised, of $1\frac{1}{2}$ convex whorls, microscopically pitted. *Whorls* $5\frac{1}{2}$, convex, the last not descending, rather swollen near the aperture ; base convex. *Suture* impressed. *Aperture* subvertical, broadly lunar. *Peristome* simple, straight, margins subconverging. *Columella* short, oblique, arcuate. *Inner lip* slightly callous and reflected, partly covering the very narrow perforation.

Diameter — Maj., 4 mm.; min., 3·7 mm.: height, 3 mm. (type). Diameter — Maj., 3·75 mm.; min., 3·5 mm.: height, 2·75 mm. (*A. Miranda*, Hutt.).

Animal.—Mantle subcentral; tail truncated, with a mucous gland below a papilla; eye-peduncles thick, approximated at their bases. Anterior portion of the animal pale-purplish, the peduncles darker; a narrow white line down the back; foot and the rest of the body yellowish-white (for *Miranda*, Hutton, T.N.Z.I., xvi, 181).

Dentition.—Hutton, *t.c.*, 181, pl. 9, f. W; pl. 11, f. S. (*Ch. Miranda*).

Jaw rudimentary, flatly plaited, the cutting-edge indented.

Radula having the formula 9 + 8 + 1 + 8 + 9. Central tooth rectangular, the base longer than broad; the reflexed portion tricuspid, the middle cusps covering three-fourths of the base. Laterals with the reflexed portion larger, reaching the posterior margin of the base, the inner side slightly indented, the outer with a well-marked cusp; median cusp with a long point. Marginals broader than long, with 4 or 5 points, the inner of which is much longer than the others.

Type of *Helix granum*, Pfr., was in the British Museum but seems to be lost. Type of *Charopa Miranda*, Hutt., in the Canterbury Museum, Christchurch.

Hab.—North Island: Hunua Range (Major Broun); Mount Pirongia (T. Urquhart); Toko, near Stratford (R. Murdoch); Waimarama (A. Hamilton); Forty-mile Bush (H. S.). South Island: Greymouth (R. Helms); Nelson; Capleston (Cavell); Bealey; Queenstown (Captain Hutton); Otarama (A. Suter); Kowai Bush (Professor Chilton).

Remarks.—Although the type of *Helix granum*, Pfr., is lost, and it has never been figured, I do not doubt its identity with *Charopa Miranda*, Hutt. The diagnoses and dimensions of the two agree very well, and I do not know another New Zealand shell that corresponds so well with Pfeiffer's species.

8. Allodiscus Mossi, Murdoch, 1897. Plate 25, fig. 13, *a*, *b*.

Flammulina (*Allodiscus*) *Mossi*, Murd., P. Mal. S., ii, 1897, 162, figs. in text.

Shell small, subdiscoidal, narrowly umbilicated, corneous, thin and semitransparent, costate. *Sculpture:* Protoconch indistinctly microscopically spirally striate; the following whorls with close, subequidistant, sharp, obliquely and flexously retractive riblets, about 10 per millimetre; the interstices with fine growth-lines, reticulated by very fine microscopic spiral liræ. *Colour* yellowish-horny, dull, spotted and somewhat reticulated with rufous markings, usually a number of larger splashes near the suture, extending to the periphery on the body-whorl; base with a few lighter-coloured spots and streaks. *Epidermis* thin, not shining. *Spire* depressed, convex, about half the height of the aperture. *Protoconch* of 1½ convex whorls, flat.

Whorls 5–5½, regularly increasing, rather convex, the last not descending, rounded; base convex, depressed in the centre. *Suture* well impressed. *Aperture* oblique, lunate. *Peristome* thin, straight, the margins slightly approaching. *Columella* short, oblique, slightly arcuate. *Inner lip* lightly callous and reflected above, extending broadly as a thin white and smooth callus over the convex parietal wall. *Umbilicus* deep, narrow, about ⅓ mm. in diameter.

Diameter—Maj., 5 mm.; min., 4·25 mm.: height, 2·8 mm.

Dentition is that characteristic of the genus.

Type, in Mr. R. Murdoch's collection, unfortunately destroyed by fire. *Co-types* in my collection.

Hab.—North Island: Wanganui; Cape Egmont; Toko, near Stratford; Manawatu (R. Murdoch); near Auckland (Captain Hutton); Mount Pirongia (T. Urquhart); Heretaunga; Dannevirke (Brooks); Otaki Gorge (H. B. Preston); Midhirst (Young); Forty-mile Bush (H. S.); Wellington. South Island: Kenepuru (McMahon); Dyer's Pass; Riccarton Bush (H. S.); Owaka. Clutha (Bryant).

Remark.—The shell resembles that of *Phenacohelix Ponsonbyi*, Suter.

9. **Allodiscus planulatus**, Hutton, 1883. Plate 25, fig. 14, *a*, *b*.

Charopa planulata, Hutt., N.Z.J.S., i, 1883, 477; T.N.Z.I., xvi, 181. *Psyra planulata*, Hutt., *t.c.*, 202. *Gerontia* (*Allodiscus*) *planulata*, Hutt.: Pilsbry, Man. Conch. (2), viii, 67. *Allodiscus planulatus*, Hutt.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 638. *Flammulina* (*Allodiscus*) *planulata*, Hutt.: Man. Conch. (2), ix, 15, pl. 3, f. 4–6; Suter, J. de Conch., xli, 252.

Shell small, depressed, subperforate or imperforate, very closely ribbed, rather shining, thin, translucent. *Sculpture:* Protoconch microscopically distinctly spirally striate; the following whorls with fine slightly undulating radial riblets, 20 to 25 per millimetre; interstices with fine growth-lines, reticulated by microscopic spiral striæ. *Colour* horny-brown, sometimes streaked and clouded with rufous. *Epidermis* thin, membranous, but lightly shining. *Spire* flatly convex, about one-fourth the height of the aperture. *Protoconch* of 1½ lightly convex whorls, flattish. *Whorls* 4½ to 5, slowly increasing, convex, periphery and base rounded, the latter impressed in the middle. *Suture* impressed. *Aperture* subvertical, broadly rotundly lunar. *Peristome* thin, simple, sharp. *Columella* very short. *Inner lip* lightly callous and reflexed above, extending broadly as a very thin white glaze over the convex parietal wall. *Umbilical perforation* very narrow, partly open or covered over by the reflected inner lip.

Diameter—Maj., 3·75 mm.; min., 3 mm.: height, 2 mm.

Dentition.—Hutton, T.N.Z.I., xvi, 181, pl. 9, f. J.

Radula having the formula 11 + 1 + 11; laterals 4. One specimen had only 9 + 1 + 9 teeth. Central tooth with a short tricuspid

reflection; laterals also tricuspid; marginals tridentate, the outer ones bidentate.

Type in the Canterbury Museum, Christchurch.

Hab.—North Island: Near Auckland (T. F. Cheeseman); Thames (Adams); Tuakau (S. Bull); Dannevirke (Brooks); Forty-mile Bush (H. S.); Waimarama (A. Hamilton); Otaki Gorge and Mangahoe (H. B. Preston); Mount Pirongia (T. Urquhart); Shannon, Manawatu (R. Murdoch); Waitakerei Range (H. S.); Kaihu, Hokianga (Strickland). South Island: Kenepuru (McMahon); Greymouth (R. Helms); Capleston (Cavell); St. Helens, Amuri (F. Suter); Springburn (Professor Dendy); Otarama (Alf. Suter); Fortrose (Miss Rich). Auckland Islands (Professor Benham).

10. Allodiscus rusticus, Suter, 1894. Plate 9, fig. 4, *a*, *b*.

Allodiscus rusticus, Sut., T.N.Z.I., xxvi, 1893 (1894), 135, pl. 20, f. 37, *a*, *b*.
Flammulina (*Allodiscus*) *rustica*, Sut., J. de Conch., xli, 253; Man. Conch. (2), ix, 338.

Shell small, subdiscoidal, perforated, not shining, costate, thin, semitransparent. *Sculpture:* Protoconch very faintly microscopically spirally striated; the following whorls with subequidistant sharp retractive radiate riblets, about 8 per millimetre; interstices with fine growth-lines and indistinct microscopic spiral striæ. *Colour* uniformly pale-horny. *Epidermis* thin, corneous. *Spire* almost flat, about one-fourth the height of the aperture. *Protoconch* of 1½ lightly convex whorls, flat. *Whorls* 5, slowly and regularly increasing, flatly rounded, periphery regularly convex; base roundish, impressed around the umbilicus. *Suture* impressed. *Aperture* oblique, lunar. *Peristome* simple, acute. *Columella* very short. *Inner lip* obliquely descending, slightly callous, not reflexed. *Umbilicus* very narrow, open, about one-tenth of the greatest diameter.

Diameter—Maj., 5 mm.; min., 4·5 mm.: height, 2·5 mm.

Animal unknown.

Type in my collection.

Hab.—Thames (T. F. Cheeseman).

Remarks.—This species is nearly allied to *A. Godeti*, which, however, has much flatter whorls, less-impressed suture, the riblets slightly closer and almost straight, not retractive, &c.

11. Allodiscus Smithi, Suter, 1894. Plate 9, fig. 5, *a*, *b*.

Allodiscus Smithi, Sut., T.N.Z.I., xxvi, 1893 (1894), 134, pl. 20, f. 36, *a*, *b*.
Flammulina (*Allodiscus*) *Smithi*, Sut., J. de Conch., xli, 253; Man. Conch. (2), ix, 338.

Shell minute, discoidal, perforated, silky, thin, diaphanous, finely costate. *Sculpture:* Protoconch distinctly microscopically spirally

striated ; succeeding whorls with very fine, close, somewhat flexuous radial riblets, about 25 per millimetre ; the insterstices microscopically reticulated by growth and spiral lines. *Colour* pale yellow with zigzag streaks of rufous. *Epidermis* thin and glossy. *Spire* perfectly flat. *Protoconch* of $1\frac{1}{4}$ convex whorls, flat. *Whorls* 4, the first three slowly the last more rapidly increasing, rounded, periphery convex ; base rounded, impressed in the centre. *Suture* impressed. *Aperture* oblique, lunar. *Peristome* straight, acute, margins very little converging. *Columella* very short. *Inner lip* oblique, very little reflexed above. *Perforation* very narrow, deep, perfectly open.

Diameter—Maj., 2·25 mm. ; min., 2 mm. : height, 1·25 mm.

Jaw horseshoe-shaped, composed of about 28 vertical narrow plaits, indenting both margins.

Radula with the formula 11 + 4 + 1 + 4 + 11. Central tooth tricuspid, with 3 cutting-points, the median extending to the posterior end of the base. Laterals tricuspid, the endodont rudimentary. Marginals broad, with a tridentate cutting-point, and sometimes with an outer small denticle.

Type in my collection.

Hab.—Mount Somers (W. W. Smith).

12. **Allodiscus tholoides,** Suter, 1907. Plate 11, fig. 8.

Flammulina (*Allodiscus*) *tholoides,* Sut., P. Mal. S., vii, 1907, 238, pl. 22, f. 8.

Shell small, depressed turbinate, imperforate, costate, thin, not shining. *Sculpture* consisting of sharp, almost straight, and subequidistant radial riblets, 8 to 9 per millimeter, extending over the base ; insterstices with very fine growth-lines and obsolete microscopical spiral striæ. *Colour* fulvous, with light-brown zigzag bands. *Epidermis* thin, not shining. *Spire* broadly dome-like, very little more than half the height of the aperture. *Protoconch* of $1\frac{1}{2}$ smooth and convex whorls. *Whorls* 5, slowly and regularly increasing, convex, but slightly flattened above ; base convex. *Suture* well impressed. *Aperture* a little oblique, lunar. *Peristome* thin and straight. *Columella* short, arcuate. *Inner lip* slightly callous, and deflexed over the umbilical region, which is but little immersed ; a thin callus on the parietal wall unites the distant margins. *Perforation* almost completely sealed up.

Diameter—Maj., 4·5 mm. ; min., 3·8 mm. : height, 3·2 mm.

Animal unknown.

Type in my collection.

Hab.—Cape Te Reinga (C. Cooper) ; Whangaroa.

Remarks.—The globular form and the distant almost straight riblets distinguish this species from the allied *A. Tullia*, *A. venulatus*, and *A. rusticus*.

13. Allodiscus Tullia, Gray, 1850. Plate 25, fig. 15, *a*, *b*.

Nanina Tullia, Gray, P.Z.S., 1849 (1850), 165; A.M.N.H. (2), vii, 65. *Helix Tullia*, Gray: Reeve, Conch. Icon., vii, pl. 207, f. 1460; Pfeiffer, M.H. Viv., iii, 35. *H.* (*Thalassia*) *Tullia*, Gray: Hector, Cat. Land Moll. N.Z., 5. *Nanina* (*Thalassia*) *Tullia*, Gray: Nomencl. Hel. Viv., 46. *Patula Tullia*, Gray, M.N.Z.M., 11. *Psyra Tullia*, Gray: Hutton, T.N.Z.I., xvi, 201. *Charopa* (*Psyra*) *Tullia*, Gray: Tryon, Man. Conch. (2), ii, 211, pl. 62, f. 40. *Allodiscus Tullia*, Gray: Hedley and Suter, P.L.S. N.S.W. (2), vii, 638. *Flammulina* (*Allodiscus*) *Tullia*, Gray: Pilsbry, Man. Conch. (2), ix, 14, 15, pl. 3, f. 12 (protoconch); pl. 2, f. 11, 12 (jaw and radula): Suter, J. de Conch., xli, 251, pl. 9, f. 2, *a–c*.

Shell depressed, imperforate, thin, closely ribbed, diaphanous, not shining. *Sculpture:* Protoconch microscopically finely spirally striate; succeeding whorls with fine sharp sinuous radial riblets, about 12 per millimetre; interstices beautifully and very distinctly microscopically reticulated. *Colour* pale yellow, faintly tessellated with rufous. *Epidermis* thin, membranous. *Spire* slightly convex, about one-third the height of the aperture. *Protoconch* of 1½ convex whorls. *Whorls* 5, rather convex, narrow, the last not descending, periphery sometimes obscurely angled; base rounded, impressed in the middle. *Suture* impressed. *Aperture* subvertical, lunar. *Peristome* simple, straight, sharp. *Columella* very short. *Inner lip* slightly callous, oblique and arcuate, reflexed above, usually producing a shallow *false perforation;* a thin white smooth callosity on the convex parietal wall.

Diameter—Maj., 4·5 mm.; min., 4 mm.: height, 2 mm.

Dentition.—Suter, T.N.Z.I., xxiv, 291, pl. 21, f. 18, 19.

Jaw slightly arcuate, not tapering, with about 14 flat broad plaits slightly indenting both margins.

Radula having the formula $80 \times 15 + 6 + 1 + 6 + 15$. Central tooth rectangular, somewhat longer than broad. Reflection tricuspid, median cusp slender, with a short cutting-point; side cusps rounded, short, each with a minute cutting-point. Laterals asymmetrical, much longer than broad; reflection bicuspid, with a strong and long mesocone and a short ectocone. Marginals broad, the first two tridentate, the mesodont much longer than the others, the last marginals small, bidentate.

Type in the British Museum.

Hab.—North Island: Auckland (Greenwood); Thames; Ohaupo (Musson); Mount Pirongia (T. Urquhart); Waimarama (A. Hamilton); Forty-mile Bush (H. S.); Ngaputahi, Tuhoe-land (A. Hamilton); Wellington (H. S.). South Island: Kenepuru (McMahon); Nelson; Oxford, Canterbury; Greymouth (R. Helms); near Christchurch (H. S.); Akaroa (F. Suter); near Lake Coleridge; western slope of Mount Cook; Hooker Valley (H. S.); Albury (W. W. Smith); Queenstown (Captain Hutton).

Var. albinus. Shell uniformly white, no colour-markings.

Hab.—Sealy Range, near the Hermitage, Mount Cook (H. S.).

14. Allodiscus Urquharti, Suter, 1894. Plate 25, fig. 16, *a*, *b*.

Allodiscus Urquharti, Sut., P.L.S. N.S.W. (2), viii, 489, pl. 22, f. 4, *a–d*. *Flammulina* (*Allodiscus*) *Urquharti*, Sut., J. de Conch., xli, 253; T.N.Z.I., xxxiv, 205.

Shell very minute, globosely depressed, umbilicated, silky, thin and fragile, transparent. *Sculpture:* Protoconch microscopically spirally striate; the succeeding whorls with extremely fine and close-set radiate riblets, which are slightly protractive and reach to the umbilicus; they number about 40 per millimetre; the interstices are microscopically reticulated. *Colour* horny, without any markings. *Spire* short, convex, about half the height of the aperture. *Protoconch* of $1\frac{1}{4}$ convex whorls. *Whorls* $3\frac{1}{2}$ to 4, narrow, slowly and regularly increasing, convex, the last not descending, periphery and base rounded. *Suture* deep. *Aperture* subvertical, rotundly lunate, much excavated by the penultimate whorl. *Peristome* simple, straight, acute, margins convergent. *Columella* very short. *Inner lip* regularly arched, not reflexed. *Umbilicus* narrow, about one-sixth of the greatest diameter, deep and open.

Diameter—Maj., 1·5 mm.; min., 1·25 mm.: height, 1 mm.

Jaw arcuate, consisting of about 14 thin plaits, indenting both margins. The central plaits are broader than those on the sides, and are separated by a narrow interstice.

Radula with the formula 18 + 1 + 18; 3 to 4 laterals. Central tooth with small rounded reflection and a sharp mesodont. Laterals bicuspid, with short cutting-points. Marginals with 3 to 4 cutting-points, the inner second point is longest; last marginal with 3 cutting-points.

Type in my collection.

Hab.—Mount Pirongia, type (T. Urquhart); Hunua Range (Major Broun); Little Barrier Island (Adams).

Remarks.—This is the minutest, widest umbilicated, and one of the closest ribbed species of the genus.

15. Allodiscus venulatus, Pfeiffer, 1857. Plate 25, fig. 17, *a*, *b*.

Helix venulata, Pfeiffer, P.Z.S., 1857, 108; M.H. Viv., iv, 163; Hector, Cat. Land Moll. N.Z., 18. *Nanina* (*Microcystis*) *venulata*, Pfr., Nomencl. Hel. Viv., 36. *Charopa* (*Psyra*) *venulata*, Pfr.: Tyron, Man. Conch. (2), ii, 211. *Patula* (*Flammulina*) *venulata*, Prf.: Hutton, M.N.Z.M., 10. *Psyra venulata*, Pfr.: Hutton, T.N.Z.I., xvi, 201. *Allodiscus venulatus*, Pfr.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 638. *Flammulina* (*Allodiscus*) *venulata*, Pfr., Man. Conch. (2), ix, 15; Suter, J. de Conch., xli, 251.

Shell depressed, imperforate, thin, closely costate, diaphanous. *Sculpture:* Protoconch microscopically spirally lirate; the following whorls with sharp sinuous radiate riblets, 5 to 6 on the periphery, 10 to 11 per millimetre near the suture; interstices with fine growth-lines and not very prominent microscopic spiral striæ. *Colour* corneous, variegated with light-reddish-brown markings. *Epidermis* thin,

not shining. *Spire* slightly elevated, convex, about half the height of the aperture. *Protoconch* of 1½ convex whorls. *Whorls* 6, convex, gradually increasing, the last not descending, slightly flattened outside the suture; base flatly rounded, impressed in the middle. *Suture* well impressed. *Aperture* vertical, elongately lunar. *Peristome* simple, acute, convex. *Columella* short, oblique. *Inner lip* with a white callus, reflexed, covering the *umbilical tract*, spreading broadly as a thin white and shining glaze over the convex parietal wall.

Diameter—Maj., 6 mm.; min., 5 mm.: height, 3 mm.

Dentition.—Hutton, T.N.Z.I., xvi, 165, pl. 11, f. Y.

Jaw arched, with about 10 flat ribs in the centre, the ends striated.

Radula with the formula 11 + 6 + 1 + 6 + 11. Central tooth tricuspid, with a long mesodont and small lateral cutting-points. Laterals like the central, but broader, the entocone larger than the ectocone. Marginals with 3 cutting-points, the entocone and mesocone coalesced into a bidentate strong point, the last marginal bidentate.

Type in the British Museum.

Hab.—Western slope of Mount Cook (Filhol); Greymouth (R. Helms); Capleston (Cavell).

16. Allodiscus wairoaensis, Suter, 1894. Plate 25, fig. 18, *a*, *b*.

Allodiscus wairoaensis, Sut.: P.L.S. N.S.W. (2), viii, 488, pl. 22, f. 3, *a*, *b*. *Flammulina* (*Allodiscus*) *wairoaensis*, Sut., Man. Conch. (2), ix, 15; Suter, J. de Conch., xli, 253.

Shell very small, subdiscoidal, perforated, rather distantly radially costate, thin, not shining, semitransparent. *Sculpture:* Protoconch microscopically distinctly spirally striated; the following whorls with sharp radiate riblets, about 7 per millimetre, situated at the periphery; interstices with fine growth-lines, reticulated by microscopic spiral liræ. *Colour* pale-horny with radiate streaks of rufous above, tessellated on the periphery, and minutely spotted on the base. *Spire* depressed, flatly convex, about one-third the height of the aperture. *Protoconch* of 1½ convex whorls. *Whorls* 4½, rounded, slowly and regularly increasing, periphery convex; base convex, impressed in the centre. *Suture* impressed. *Aperture* slightly oblique, lunar, considerably excavated by the penultimate whorl. *Peristome* straight, acute, regularly convex, margins very little approximating. *Columella* short. *Inner lip* obliquely arcuate, slightly callous, reflexed above, extending broadly as a thin white layer over the convex parietal wall. *Perforation* very narrow, quite open in young specimens, but sometimes partly covered by the inner lip in adult examples.

Diameter—Maj., 3·25 mm.; min., 2·75 mm.: height, 2 mm.

Animal unknown.

Type in my collection.

Hab.—Wairoa Gorge, Nelson (Meeson).

Remarks.—This species is nearest to *A. venulatus*, but it is much smaller, perforated, and the costæ more distant.

Genus 5. Thermia, Hutton, 1904.

Thermia, Hutt., P.L.S. N.S.W., xxix, 1904, 461. Type: *T. Cressida*, Hutton. *Pyrrha*, Hutton, T.N.Z.I., xvi, 1884, 200; Pilsbry, Man. Conch. (2), ix, 15; not of Cabanis, 1849, in Aves.

Animal heliciform, mantle subcentral, reflected over the peristome with an even margin; tail truncate, with a large papilla and mucous gland.

Jaw arcuate, flatly plaited.

Dentition: Central tooth with the mesocone only developed. Laterals bicuspid, the entocones suppressed. Marginal teeth with several cusps.

Shell depressed globose, thin, translucent, striated and sometimes minutely reticulated, imperforate or narrowly umbilicated; peristome simple.

Distribution.—New Zealand.

Key to Species.

A. Shell striately plaited, no distinct riblets.
  a. No distinct microscopic spiral striæ; whorls 5½; perforation closed, or only a little uncovered; shell large, 12¼ mm. by 8¼ mm. .. .. *Cressida.*
  aa. Microscopic spiral striæ very distinct; whorls 4½; perforation only half-covered; shell smaller, more depressed, 9 mm. by 5·5 mm. .. .. .. *virescens.*
B. Shell distinctly ribbed, 10 riblets per millimetre.
  a. Protoconch microscopically spirally striate; spire about two-thirds the height of aperture; whorls 4¼, subangled; perforation narrow, open; shell small, 2·9 mm by 2 mm. .. .. *expeditionis.*
  aa. No microscopic spiral striæ; spire about half the height of aperture; whorls 5, distinctly angled; perforation nearly or quite covered; shell larger, more depressed, 8½ mm. by 5½ mm. .. .. *subincarnata.*

1. Thermia Cressida, Hutton, 1883. Plate 50, fig. 6.

Pfeifferia (?) *Cressida*, Hutt., N.Z.J.S., i, 1883, 476; T.N.Z.I., xvi, 178. *Pyrrha Cressida*, Hutt., *l.c.*, 200. *Gerontia* (*Pyrrha*) *Cressida*, Hutt.: Pilsbry, Man. Conch. (2), viii, 72. *Flammulina* (*Pyrrha*) *Cressida*, Hutt.: Pilsbry, *l.c.*, ix, 15, pl. 3, f. 17–19. *Pyrrha Cressida*, Hutt.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 640. *Flammulina* (*Pyrrha*) *Cressida*, Hutt.: Suter, J. de Conch., xli, 248.

Shell turbinate, depressed, very thin and fragile, translucent, umbilicus covered. *Sculpture* formed by irregular, obliquely retractive, somewhat sinuous striæ and plaits, sometimes with a few distant faint spiral lines. *Colour* fulvous or olive-horny. *Epidermis* thin, shining, transparent. *Spire* convex, half the height of the aperture. *Protoconch* of 1¾ flatly convex and smooth whorls. *Whorls* 5½, slowly increasing, rounded, periphery of last whorl slightly angled; base convex. *Suture* impressed. *Aperture* slightly oblique, lunately rotund. *Peristome* thin and sharp, regularly arched. *Columella* oblique. *Inner lip* slightly thickened and reflexed over the *perforation*,

sometimes completely covering it; a thin glossy layer on the parietal wall.

Diameter—Maj., 12·25 mm.; min., 9·75 mm.: height, 8·25 mm.

Dentition.—Hutton, T.N.Z.I., xvi, 178, pl. 9, f. X; pl. 11, f. N.

Jaw arcuate, flatly plaited, the plaits indenting both margins.

Radula with the central tooth rectangular, tricuspid, the side cusps minute; laterals bicuspid, the inner cutting-point much longer than the outer; marginals broad, with several cutting-points, the two inner ones largest.

Type in the Canterbury Museum, Christchurch.

Hab.—Southland, type (G. M. Thomson); Preservation Inlet (Captain Hutton); Haast River (Haast); Greymouth (R. Helms); The Nuggets, Port Molyneux (A. Hamilton); Kenepuru (McMahon); Stewart Island (T. Kirk).

Remarks.—Wellington (T. W. Kirk) is also given as habitat of the species, but I wish to point out that T. W. Kirk's statements regarding the habitat of land-shells are not reliable.

2. Thermia (?) expeditionis, Suter, 1909. Plate 25, fig. 19. *a*, *b*.

Thermia (?) *expeditionis*, Suter, Subantarct. Islds. N.Z., i, 1909, 34, pl. 1, f. 6–8.

Shell small, depressed globose, umbilicated, very thin, translucent, somewhat shining, radially plicately ribbed. *Sculpture:* Protoconch microscopically spirally striate; the succeeding whorls with radial rounded and flexuous riblets, about 10 per millimetre, slightly inequidistant, and getting obsolete upon the base. *Colour* uniformly olive. *Epidermis* thin and slightly polished. *Spire* depressed conoidal, its height less than that of the aperture. *Protoconch* of 2 slightly convex whorls. *Whorls* $4\frac{1}{4}$, regularly increasing, flatly convex, periphery of last whorl rounded, very faintly angled; base convex. *Suture* deep. *Aperture* oval, somewhat excavated by the parietal wall, which is slightly convex. *Peristome* sharp, simple. *Columella* vertical, the inner lip slightly reflexed. *Umbilicus* narrow, open, deep.

Diameter—Maj., 2·9 mm.; min., 2·5 mm.: height, 2 mm.

Animal unknown, and therefore the generic position somewhat uncertain.

Type in the Canterbury Museum, Christchurch.

Hab.—Auckland Island, under a log; one specimen only (Professor Benham).

3. Thermia subincarnata, Suter, 1894. Plate 9, fig. 6, *a*, *b*.

Pyrrha subincarnata, Sut., T.N.Z.I., xxvi, 1893 (1894), 133, pl. 19, f. 33; pl. 20, f. 34, 35. *Flammulina* (*Pyrrha*) *subincarnata*, Sut., J. de Conch., xli, 248; Man. Conch. (2), ix, 338.

Shell globosely depressed, sub- or im-perforate, upper surface dull, base polished, reddish, thin, pellucid. *Sculpture* consisting of

somewhat irregular, close, retractive, flexuous riblets, about 10 per millimetre; the interstices with fine growth-lines, but not reticulated. *Colour* from corneous to flesh-colour; young specimens usually corneous all over, adult shells either reddish at the apex and round the peristome or the flesh-colour may extend over the whole shell. *Spire* depressed conoidal, convex, half the height of the aperture. *Protoconch* of 1½ whorls, slightly radiately striated. *Whorls* 5, slowly and regularly increasing, flatly rounded, periphery distinctly angled; base convex, impressed at the middle. *Suture* impressed. *Aperture* oblique, transverse, ovately lunar. *Peristome* straight, thickened by a pinkish callosity, which unites the very slightly converging margins on the parietal wall as a thin glaze. *Columella* short. *Inner lip* oblique, arcuate, callous, reflexed above, and usually closing the *perforation*; young shells are narrowly perforated or subperforated.

Diameter—Maj., 8·5 mm.; min., 7·5 mm.: height, 5·5 mm.

Jaw slightly arcuate, with an indistinct median projection inferiorly, with numerous vertical indistinct folds, ends rounded.

Radula with the formula 29 + 1 + 29; laterals about 8. The central tooth longer than broad, tricuspid, median cusp reaching to the end of the base, and its broad short cutting-point over the next row of teeth. Laterals similar to the central. Marginals tridentate, broad; median tooth long and stout, the others small; outer marginals bidentate.

Type in my collection.

Hab.—Toko, near Stratford, type (R. Murdoch); Upper Wanganui River.

4. Thermia virescens, Suter, 1899. Plate 25, fig. 20, *a*, *b*.

Flammulina (*Pyrrha*) *virescens*, Sut., P. Mal. S., iii, 1899, 287, pl. 15, f. 3–7.

Shell small, globosely depressed, perforate, faintly shining, greenish, thin, semitransparent. *Sculpture*: Protoconch microscopically very finely decussate; the following whorls with irregular retractive sinuous plaits; the interstices with minute growth-striæ and distinct close spiral liræ. *Colour* corneous, with a greenish hue, more distinct on the base. *Epidermis* thin, transparent, somewhat shining. *Spire* depressed conoidal, convex, about half the height of the aperture. *Protoconch* of 1½ flattish whorls. *Whorls* 4½, first slowly then more rapidly increasing, flatly convex, periphery rounded, subangled in young specimens; base convex, impressed at the centre. *Suture* impressed. *Aperture* oblique, transverse, ovately lunar. *Peristome* simple, acute, extremities distant, subconvergent. *Columella* short, oblique. *Inner lip* very thin, reflexed above, extending as a very thin glaze over the convex parietal wall. *Umbilicus* narrow, half-hidden by the columellar reflexion.

Diameter—Maj., 9 mm.; min., 7·5 mm.: height, 5·5 mm. Diameter of the perforation, 0·5 mm.

Animal with a well-developed caudal gland.

Jaw, *Radula*, and *Reproductive Organs*.—Plate 1, fig. 12.

Jaw slightly arcuate, narrower in the middle, very thin, consisting of about 45 narrow straight plaits, lying close together, which are finely longitudinally striate, and indent the cutting-edge.

Radula has the formula 23 + 10 + 1 + 10 + 23. The central tooth is long and narrow, reflected portion short, tricuspid, covering about one-third of the basal plate; the median cusp is short and broad, with a small rounded mesocone; the lateral cusps minute. The laterals with a short broad inner cusp, with short rounded cone, and a small outer cusp, in the outer laterals the inner cusp is strong and broad. Marginals tricuspid, short and broad, the mesodont at first flanked by a narrow sharp endodont, and at a wider interval by a small ectodont; gradually the endodont and mesodont coalesce, till they finally form a single bifid denticle, with a small separate ectodont; the last marginal minute, with a small denticle.

Reproductive Organs.—There is a long vestibule; the male organ is stout, broad, somewhat enlarged below the middle, constricted above it, the distal end is flatly convex, the retractor muscle inserted at its anterior side, on the posterior side the vas deferens enters. A rather long distance from the juncture of the male organ with the vestibule, on the opposite side, the long subcylindrical receptaculum seminis arises; this tapers off at its extremity, and forms a rather long filiform cæcum, slightly globular at its end. The most interesting feature in these reproductive organs is a fan-shaped radially grooved appendiculum just opposite the receptaculum seminis.

Type in my collection.

Hab.—At the foot of Mount Stokes, Marlborough, type (McMahon); Happy Valley, Canterbury (F. Suter).

Genus 6. Serpho. Hutton, 1904.

Serpho, Hutt., P.L.S. N.S.W., xxix, 1904, 461. Type: *Nanina* (?) *Kivi*, Gray. *Carthæa*, Hutton, T.N.Z.I., xvi, 1883 (1884), 189; not of Walker, 1858, in Lepidoptera.

Animal heliciform, with a mucous caudal gland. Jaw formed by many quadrate overlapping plates, each higher than broad. Radula with broad blunt mesodonts on the central and lateral teeth, marginals with several cutting-points, the inner one bluntly bidentate.

Shell conoidly globose, the whorls slowly increasing; sub- or imperforate; aperture lunate; peristome straight, acute; the columellar margin rather reflexed.

Distribution.—New Zealand.

A species from Norfolk Island (*Helix Stoddarti*, Gray) has been classed under this genus, although the animal of that species is still unknown. I think it belongs to another genus, and not to the *Phenacohelicidæ* at all. But there is a species from Natal apparently nearly allied—at least, as far as shell-characters go: *Phasis inclara*, Morelet.

1. Serpho Kivi, Gray, 1843. Plate 50, fig. 7.

Nanina (?) *Kivi*, Gray, Dieff. N.Z., 262. *Helix Kivi*, Gray: Pfeiffer, M.H. Viv., i, 192; Reeve, Conch. Icon., vii, pl. 130, f. 794; Ereb. & Ter., 1, pl. 1, f. 1; Hector, Cat. Land Moll. N.Z., 17. *Nanina* (*Microcystis*) *Kivi*, Gray, Nomencl. Hel. Viv., 36. *Helix Kivi*, Gray: Hutton, M.N.Z.M., 20. *Carthæa Kiwi*, Gray: Hutton, T.N.Z.I., xvi, 189. *Helix* (*Carthæa*) *Kivi*, Gray: Tryon, Man. Conch. (2), iii, 37, pl. 21, f. 8–10. *Carthæa Kivi*, Gray: Hedley and Suter, P.L.S. N.S.W. (2), vii, 633. *Flammulina* (*Carthæa*) *Kivi*, Gray: Pilsbry, Man. Conch. (2), ix, 339; Suter, J. de Conch., xli, 247. *Helix irradiata*, Gould, P. Bost. S.N.H., ii, 1848, 178; U.S. Expl. Exp., xii, 34, pl. 5, f. 65, *a–c*; Pfeiffer. M.H. Viv., i, 29; Cox, Mon. Austral. Land Shells, 35, pl. 20, f. 10, *a*, *b*: Hutton, M.N.Z.M., 20. *H. radiaria*, Pfeiffer, P.Z.S., 1854 (1855), 55; M.H. Viv., iv, 166; Reeve, Conch. Icon., vii, pl. 189, f. 1322. *Charopa* (*Thalassia*) *radiaria*, Pfr.: Tryon, Man. Conch. (2), ii, 213, pl. 62, f. 52.

Shell turbinate, sub- or im-perforate, thin and fragile, not shining. *Sculpture:* Protoconch microscopically finely spirally striated; the succeeding whorls closely radially striated, the striæ on the upper whorls sometimes real riblets, 7 to 8 per millimetre, they are obliquely retractive and flexuous; interstices with minute growth-lines and spiral striæ. *Colour* white, with short irregular oblique purple-brown streaks. *Spire* subconical, obtuse, lightly convex, nearly the same height as the aperture. *Protoconch* conoidal, of $1\frac{1}{2}$ convex whorls. *Whorls* 6, flattish, the last distinctly angled on the first half of the periphery, subangled on approaching the aperture; base convex, flattened and slightly depressed in the middle. *Suture* well marked, not deep. *Aperture* oblique, broad, lunar. *Peristome* simple, straight. *Columella* very short, vertical. *Inner lip* callous, oblique, reflexed above and quite or partly closing the *perforation*, continued broadly as a thin callosity over the convex parietal wall.

Diameter—Maj., 10 mm.; min., 9 mm.: height, 8 mm.

Dentition.—Hutton, T.N.Z.I., xvi, 170, pl. 9, f. A; pl. 11, f. 1.

Jaw composed of about 50 separate overlapping plates, the length of which is four or five times the breadth; all the plates transversely striated.

Radula (Plate 1, fig. 13) with the formula $28 + 1 + 28$; laterals about 15. Central tooth rectangular, the length twice the breadth, the reflexed portion not reaching half-way over the base, and slightly constricted at the sides, with a broad cutting-point. Laterals with the reflexed portion situated on the inner margin, and an additional small point on the outer side. Inner marginals with a broad blunt double cutting-point, with several small acute ones outside it; outer marginals with 3 or 4 acute points.

Type in the British Museum.

Hab.—North Island: Tom Bowline's Bay, North Cape (C. Cooper); Hokianga; Bay of Islands; Whangarei; Whangaroa; Great Omaha; Waiwera; Kaitaia (R. H. Matthews); Waitakerei Range (H. S.); Titirangi; Thames; Waiheke Island (H. S.); Taupiri; Ohaupo; Midhirst, Taranaki; Hunua Range; Mount Pirongia; Hawke's Bay; Wellington? (T. W. Kirk).

Remarks.—H. irradiata, Gould, was wrongly ascribed to Australia, and *H. radiaria*, Pfr., to the Solomon Islands.

2. Serpho Matthewsi, Suter, 1909. Plate 26, fig. 1.

Serpho Matthewsi, Sut., P. Mal. S., viii, 1909, 259, pl. 11, f. 19.

Shell small, turbinate, perforate, thin and fragile, radially ribbed, not shining. *Sculpture* consisting of fine, inequidistant, retractive, flexuous radial riblets on the post-nuclear whorls, extending on the base down to the perforation, their number being 6–8 per millimetre; all whorls have fine and dense microscopic spiral striæ, passing over the riblets and decussating the fine growth-lines of their interstices. *Colour:* Protoconch light-yellowish with arcuate radial fuscous streaks, which are sometimes present on the next volution, but then get obsolete, giving place to a uniform light-brown colour, interrupted only by a whitish band below the suture, and a white central disc on the base; riblets white. *Epidermis* thin, dull. *Spire* elevated, conoidal, apex rather blunt, outlines somewhat convex, its height the same as that of the aperture. *Protoconch* of $1\frac{3}{4}$ convex whorls, the nucleus very little convexly raised. *Whorls* $4\frac{3}{4}$ to 5, regularly increasing, convex, periphery of body-whorl regularly arched; base rounded. *Aperture* oblique, lunate. *Peristome* simple, sharp. *Columella* short, slightly arcuate. *Inner lip* lightly callous, reflexed above and partly covering the distinct narrow *perforation*, spreading broadly as a thin shining glaze over the parietal wall.

Diameter—Maj., 7·5 mm.; min., 6·7 mm.: height, 6 mm.

Animal unknown.

Type in my collection.

Hab.—Kaitaia, North Island (R. H. Matthews).

Genus 7. Therasia, Hutton, 1883.

Therasia, Hutt., N.Z.J.S., i, 1883, 477. Type: *T. Thaisa*, Hutton.

Animal elongated; mantle subcentral, included; foot long and narrow, reaching beyond the shell, rounded behind, slightly truncated, and with a mucous gland situated under a caudal papilla.

Jaw membranous, arcuate or horseshoe-shaped, with broad imbricating plates.

Dentition: Central teeth narrow, with small reflection, the mesocone long, ectocones hardly visible. Lateral teeth with larger reflection, the inner ones without side cusps, the outer tricuspid. Marginal teeth multicuspid, very variable.

Shell depressed, perforate or umbilicate, thin, with conoidal spire; the periphery angular or subangular; aperture round-lunar; lip thin, slightly reflexed at the columella; surface striated; protoconch spirally striated.

Resembles *Allodiscus* in the dentition and the spirally striated apex of the shell, but differs in the form and sculpture of the latter, which is much more as in *Thalassohelix*.

Distribution.—New Zealand.

KEY TO SPECIES.

A. Greatest diameter of shell not or not much more than 4 mm. ; shell with membranous plaits
  a. Shell subperforate, with microscopic spiral striæ, peripheral processes sharply pointed .. .. *Celinde.*
  aa. Shell with a narrow open perforation, no microscopic spiral striæ, peripheral processes rounded .. .. .. *Tamora.*
B. Greatest diameter of shell considerably more than 4 mm.
  a. Periphery of shell sharply keeled.
    b. Microscopic spiral sculpture indistinct, height of spire equal to that of the aperture. Dimensions, 7 mm. by 4 mm. *antipoda.*
    bb. Microscopic spiral sculpture prominent, height of spire two-thirds that of aperture. Dimensions, 11½ mm. by 7½ mm. .. .. *Traversi.*
  aa. Periphery of shell angled or subangled.
    b. Shell radially ribbed.
      c. Shell with fine sharp riblets, 15 per millimetre. Dimensions, 6¼ mm. by 3¾ mm. .. .. *Valeria.*
      cc. Shell with membranous deciduous riblets, 3–4 per millimetre, sometimes only growth-striation, distinctly microscopically reticulated. Dimensions, 9½ mm. by 7 mm. .. .. *decidua.*
    bb. Shell not ribbed, but more or less distinctly obliquely striated.
      c. Microscopic spiral sculpture indistinct, outlines of spire convex, periphery but little angled. Dimensions, 8 mm. by 4½ mm. .. .. .. *Ophelia.*
      cc. Microscopic spiral lines exceedingly fine and dense, strongly and irregularly striated, outlines of spire nearly straight, periphery angled. Dimensions, 10¼ mm. by 7–8 mm. .. .. .. *Thaisa.*

1. Therasia (?) antipoda, Hombron and Jacquinot, 1854. Plate 26, fig. 2. *a*, *b*.

Helix antipoda, H. & J., Voy. P.S., v, 18, pl. 6, f. 13–16; Pfeiffer, M.H. Viv., iv, 111; Hector, Cat. Land Moll. N.Z., 15; Hutton, M.N.Z.M., 19. *Nanina* (*Thalassia*) *antipoda*, H. & J., Nomencl. Hel. Viv., 47. *Charopa* (*Thalassia*) *zelandiæ antipoda*, H. & J.: Tryon, Man. Conch. (2), ii, 214, pl. 63, f. 65–67. *Thalassia neozelanica antipoda*, H. & J.: Hutton, T.N.Z.I., xvi, 204; Hedley and Suter, P.L.S. N.S.W. (2), vii, 637. *Flammulina* (*Thalassia*) *zelandiæ antipoda*, H. & J.: Suter, J. de Conch., xli, 255. *Helix aucklandica*, Le Guillou, Revue Zool., v, 1842, 140; Pfeiffer, M.H. Viv., i, 119. *H.* (*Thalassia*) *aucklandica*, Le Guill.: Hector, Cat. Land Moll. N.Z., 15. *Nanina* (*Thalassia*) *aucklandica*, Le Guill., Nomencl. Hel. Viv., 47. *Helix aucklandica*, Le Guill.: Hutton, M.N.Z.M., 19. *Thalassia neozelanica aucklandica*, Le Guill.: Hutton, T.N.Z.I., xvi, 204. *Charopa* (*Thalassia*) *zelandiæ aucklandica*, Le Guill.: Tryon, Man. Conch. (2), ii, 214. *Thalassohelix* (?) *aucklandica*, Le Guill.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 637. *Flammulina* (*Thalassohelix*) *aucklandica*, Le Guill.: Suter, J. de Conch., xli, 255.

Shell small, orbicularly conoidal, umbilicated, striated, shining, thin and semitransparent, periphery keeled. *Sculpture*. Protoconch indistinctly microscopically spirally striate; the following whorls with inequidistant and very unequal oblique radial striæ and plaits; the

interstices minutely reticulated by growth and spiral striation ; the radial sculpture less prominent over the base. *Colour* yellowish-brown, with radial unequal streaks of rufous. *Epidermis* very thin and shining. *Spire* broadly conoidal, of about the same height as the aperture. *Protoconch* of $1\frac{1}{2}$ smooth and flatly convex whorls. *Whorls* $5\frac{1}{2}$ to 6, regularly increasing, flattish, the last sharply keeled ; base convex. *Suture* much impressed. *Aperture* broadly subquadrangular. *Peristome* acute, simple, very thin. *Outer lip* descending almost straight, angled on meeting the slightly convex basal lip. *Columella* oblique, concave, slightly reflexed. *Perforation* moderate, somewhat perspective, deep.

Diameter, 7 mm. ; height, 4 mm. (type).

Jaw arcuate, composed of numerous vertical plaits.

Radula.—Only a very young specimen was at my disposal, and the teeth were not sufficiently differentiated to decide whether the species is a *Therasia* or *Thalassohelix*.

Type in the Mus. Hist. Nat., Paris.

Hab.—Auckland Islands (Hombron and Jacquinot, Le Guillou, Krone, Professor Benham) ; found under logs.

Remark.—I accept H. & J.'s name because they figured the species.

Subsp. chathamensis, Suter, 1909. Plate 26, fig. 3.

Therasia antipoda chathamensis, Sut., P. Mal. S., viii, 1909, 259, pl. 11, f. 20.

The following characters distinguish the subspecies from the species : The radial sculpture consists of less-prominent striæ and plications ; the rufous streaks are narrower, more numerous, and often zigzag-shaped ; the whorls are much more convex, the last more or less angled at the periphery, never sharply keeled ; suture deeper ; aperture roundly oval, the outer lip but slightly angled, and the basal lip more convex.

Diameter—Maj., 7·1 mm. ; min., 6·5 mm. : height, 4 mm.

Animal unknown.

Type in my collection.

Hab.—Chatham Islands (Captain Hutton) ; Stewart Island (C. Traill).

2. Therasia Celinde, Gray, 1850. Plate 26, fig. 4, *a*, *b*.

Nanina (?) *Celinde*, Gray, P.Z.S., 1849 (1850), 164 ; A.M.N.H. (2), vii, 64. *Helix Celinde*, Gray : Pfeiffer, M.H. Viv., iii, 125 ; Reeve, Conch. Icon., vii, pl. 131, f. 799. *H.* (*Thalassia*) *Celinde*, Gray : Hector, Cat. Land Moll. N.Z., 16. *Nanina* (*Thalassia*) *Celinde*, Gray : Nomencl. Hel. Viv., 47. *Patula Celinde*, Gray : Hutton, M.N.Z.M., 6. *Charopa* (*Therasia*) *Celinde*, Gray : Tryon, Man. Conch. (2), ii, 211, pl. 62, f. 41. *Therasia Celinda*, Gray : Hutton, T.N.Z.I., xvi, 202 ; Hedley and Suter, P.L.S. N.S.W. (2), vii, 644. *Flammulina* (*Therasia*) *Celinde*, Gray : Suter, J. de Conch., xli, 244 ; Man. Conch. (2), ix, 16.

Shell small, subperforate, rather depressed, membranously plaited, thin, pellucid. *Sculpture :* Protoconch microscopically rather distantly spirally striate ; the following whorls with distant membran-

aceous thin plaits, about 4 per millimetre, sometimes inequidistant, produced at the periphery into elongated triangular acute membranous processes; interstices minutely reticulated by growth and spiral lines. *Colour* pale brown to greenish-corneous. *Epidermis* thin, not shining. *Spire* conoidal, rather acute, a little higher than the aperture. *Protoconch* of $1\frac{1}{2}$ convex whorls, mostly corroded. *Whorls* 5, firmly pressed together, the last sharply angled, not descending in front; base rather convex, impressed in the middle. *Suture* impressed. *Aperture* oblique, subtriangularly lunar. *Peristome* acute, with an inner thin callosity. The *outer lip* angled. *Columella* very short. *Inner lip* oblique, callous, reflexed above and partly or entirely closing the narrow *perforation;* parietal wall with a thin white callus.

Diameter—Maj., 4 mm.; min., $3\frac{3}{4}$ mm.: height, $2\frac{1}{3}$ mm. (type).

Dentition.—Hutton, T.N.Z.I., xvi, 162, pl. 9, f. O; pl. 11, f. U.

Jaw slightly arcuate, with flat ribs; very delicate.

Radula with the formula 18+1+18; laterals about 5. Central tooth tricuspid; laterals with a long mesocone; marginals bidentate, the inner cutting-point large.

Type in the British Museum.

Hab.—North Island: Whangaroa; Whangarei; Little Barrier Island (Adams); Waiheke Island (H. S.); Thames; Hillyer's Creek; Birkenhead; Mount Wellington lava-fields, near Auckland; Hunua Range (Major Broun); Ohaupo (Musson); Mount Pirongia (T. Urquhart); Tuakau (S. Bull); Waitakerei Range (H. S.); Ngaputahi, Tuhoe-land (A. Hamilton); Ormondville; Toko, near Stratford (R. Murdoch); near Rotorua; Forty-mile Bush (H. S.). South Island: Happy Valley, Canterbury (F. Suter).

3. Therasia decidua, Pfeiffer, 1857. Plate 50, fig. 8.

Helix decidua, Pfr., P.Z.S., 1857, 108; M.H. Viv., iv, 71; Hector, Cat. Land Moll. N.Z., 9. *Patula* (*Charopa*) *decidua*, Pfr., Nomencl. Hel. Viv., 97. *P. decidua*, Pfr.: Hutton, M.N.Z.M., 6. *Therasia decidua*, Pfr.: Hutton, T.N.Z.I., xvi, 203. *Gerontia* (*Therasia*) *decidua*, Pfr.: Pilsbry, Man. Conch. (2), viii, 71, pl. 22, f. 52–54. *Therasia decidua*, Pfr.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 641. *Flammulina* (*Therasia*) *decidua*, Pfr.: Suter, J. de Conch., xli, 245; Man. Conch. (2), ix, 16.

Shell depressed, subglobose, thin and fragile, narrowly umbilicated. *Sculpture:* Protoconch microscopically spirally striate, the succeeding whorls with membranaceous deciduous fine riblets, 3 to 4 per millimetre; they are oblique, retractive, flexuous, and somewhat inequidistant; very often these riblets are altogether absent, fine growth-lines taking their place; interstices with fine growth-lines and minute spiral liræ. *Colour* brownish-horny, with reddish streaks following the direction of the riblets and extending over the base; very often there are only faint or no colour-markings. *Epidermis* thin, subtranslucent, faintly shining or dull. *Spire* low conoidal, apex blunt, outlines lightly convex, the height very little more than half that of the aperture. *Protoconch* of $1\frac{1}{2}$ convex whorls, the nucleus slightly raised.

Whorls 5, rather convex, slowly increasing, the last sub- or acutely angled at the periphery; base flatly convex. *Suture* impressed. *Aperture* somewhat oblique, round-lunate. *Peristome* thin, simple. *Columella* short, arcuate. *Inner lip* very little callous, strongly reflexed above and partly hiding the narrow and deep umbilicus; parietal wall with a thin shining transparent glaze.

Diameter—Maj., 9·5 mm.; min., 8·5 mm.: height, 7 mm.

Animal slender, finely wrinkled, yellowish-white. Oculiferous tentacles long, slender, black, with 2 black longitudinal lines extending over the neck, which is yellowish spotted with white. Mantle subcentral, marbled with black. Foot long and narrow, with a peripodial groove, rounded behind, and with a caudal gland. Length of animal, about 13 mm.; width of sole, 1½ mm.

Dentition.—Suter, T.N.Z.I., xxiv. 291, pl. 21, f. 16. 17; Man. Conch. (2), ix, pl. 2, f. 19. 20.

Jaw membranaceous, horseshoe-shaped, with imbricating plaits, which are very broad in the centre, narrower towards the ends; cutting-edge with a median projection.

Radula with the formula $80 \times 15+6+1+6+15$. Central tooth rectangular, long and narrow, reflection small, mesocone long, ectocones obsolete. Laterals with a broader base and larger reflection, the inner teeth with one cutting-point, the outer ones tricuspid, with a strong mesodont. Marginals first bicuspid, then tricuspid, the cutting-points sometimes coalescing.

Type in the British Museum.

Hab.—North Island: Tom Bowline's Bay, near North Cape (C. Cooper); Whangaruru; Whangaroa; Whangarei; Chicken Island (C. Cooper); Helena Bay; Mokohinau Island; Little Barrier Island (Adams); Rangitoto Island; Wade; Thames; Auckland; East Island (Captain Bollons); Ruatahuna (E. Best); Manawatu Gorge (W. W. Smith); Wellington; Dannevirke; Mauriceville (H. S.). South Island: Wairoa Gorge; Nelson; Amuri (F. Suter); Kaikoura (Marriner); Happy Valley, Canterbury (F. Suter); Hossack Downs (E. Suter); Sealy Range and Hooker Valley (H. S.).

Fossil in the Pleistocene of Petane and Matapiro; no doubt erroneously determined as *Therasia Thaisa* by Hutton.

4. Therasia Ophelia, Pfeiffer, 1855. Plate 50, fig. 9.

Helix Ophelia, Pfr., P.Z.S., 1854 (1855), 146: M.H. Viv., iv, 29: Reeve, Conch. Icon., vii, pl. 191, f. 1345: Cox, Mon. Austral. Land Shells, 34, pl. 9, f. 4; pl. 17, f. 17. *H.* (*Trochomorpha*) *Ophelia*, Pfr.: Hector, Cat. Land Moll. N.Z., 6. *Trochomorpha Ophelia*, Pfr., Nomencl. Hel. Viv., 80. *Helix Ophelia*, Pfr.: Hutton, M.N.Z.M., 18. *Therasia Ophelia*, Pfr.: Hutton, T.N.Z.I., xvi, 202. *Charopa* (*Therasia*) *Ophelia*, Pfr.: Tryon, Man. Conch. (2), ii, 211, pl. 62, f. 42. *Therasia Ophelia*, Pfr.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 640. *Flammulina* (*Therasia*) *Ophelia*, Pfr.: Suter, J. de Conch., xli, 245; Man. Conch. (2), ix, 16.

Shell turbinately depressed, narrowly umbilicated, thin, not shining, diaphanous. *Sculpture:* Protoconch microscopically faintly spirally

striate; the following whorls with fine hair-like retractive and flexuous oblique striæ; the interstices with minute growth-lines and indistinct microscopic spiral striæ. *Colour* corneous to brown, faintly marked with narrow reddish streaks. *Epidermis* thin, not shining, easily peeling off. *Spire* conoidal, convex, about two-thirds the height of the aperture. *Protoconch* flatly convex, of 1½ whorls. *Whorls* 5, flattish, gradually increasing, the last not descending, subangular; base flatly rounded. *Suture* not much impressed. *Aperture* oblique, rotundly lunate. *Peristome* simple, straight, margins slightly converging, basal margin rather constricted. *Columella* short, arcuate. *Inner margin* obliquely descending, slightly callous, reflexed above, spreading as a thin layer over the parietal wall. *Umbilicus* narrow, deep, half-hidden by the columellar reflection.

Diameter—Maj., 8 mm.; min., 7 mm.: height, 4·5 mm.

Animal unknown.

Type in the British Museum.

Hab.—North Island: Bay of Islands (Hochstetter); near Auckland. South Island: Dunedin (Captain Hutton); Dyer's Pass (H. S.); Waipara; Lake Guyon; Castle Rock, Southland; Waitaki; Hurunui. Found under stones.

Remarks.—Erroneously reported from Australia. The umbilicus is wider and the periphery more rounded than in the very nearly allied *T. decidua*.

5. Therasia Tamora, Hutton, 1883. Plate 9, fig. 7, *a*, *b*.

Therasia Tamora, Hutt., N.Z.J.S., i, 477; T.N.Z.I., xvi, 1883 (1884), 182, 202; Hedley and Suter, P.L.S. N.S.W. (2), vii, 641. *Gerontia* (*Therasia*) *Tamora*, Hutt.: Pilsbry, Man. Conch. (2), viii, 70, pl. 22, f. 49–51. *Flammulina* (*Therasia*) *Tamora*, Hutt.: Suter, J. de Conch., xli, 246; Man. Conch. (2), ix, 16.

Shell small, conical, umbilicated, thin, with membranous ribs and processes. *Sculpture* consisting of rather distant, oblique, retractive membranous riblets, about 5 per millimetre, produced at the periphery into oblong membranous processes with a rounded apex; interstices with minute growth-lines; no spiral sculpture. *Colour* corneous to brown. *Epidermis* thin, lustreless, very easily rubbed off. *Spire* conical, rather acute, about the same height as the aperture; outlines lightly concave. *Protoconch* of 1½ smooth and convex whorls, elevated. *Whorls* 5, rather flattened, the last not descending, its periphery distinctly angled; base lightly convex. *Suture* impressed. *Aperture* transversely oval. *Peristome* thin, the margins converging. *Outer lip* acutely arched; the *basal lip* broadly rounded. *Columella* short, arcuate. *Inner lip* slightly callous, somewhat expanded, but not reflexed, spreading as a thin callosity over the convex parietal wall. *Umbilicus* narrow, deep, open.

Diameter—Maj., 4 mm.; min., 3·5 mm.: height, 2·5 mm.

Animal unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—Auckland, type (Cheeseman); near North Cape (C. Cooper); Whangaroa (C. Traill); Whangarei (Musson); Waiheke Island; Swanson (H. S.); Mount Wellington lava-fields (Musson); Hunua Range (Major Broun); Tuakau; Ohaupo (Musson); Mount Pirongia (T. Urquhart); Toko, near Stratford (R. Murdoch). Not known from the South Island.

6. Therasia Thaisa, Hutton, 1883. Plate 50, fig. 10.

Therasia Thaisa, Hutt., N.Z.J.S., i, 477; T.N.Z.I., xvi, 1883 (1884), 182, 202; Hedley and Suter, P.L.S. N.S.W. (2), vii, 641. *Gerontia* (*Therasia*) *Thaisa*, Hutt.: Pilsbry, Man. Conch. (2), viii, 70. *Flammulina* (*Therasia*) *Thaisa*, Hutt.: Pilsbry, *l.c.* (2), ix, 16, pl. 3, f. 14–16; Suter, J. de Conch., xli, 246.

Shell depressed, umbilicated, striated, rather solid. *Sculpture:* Protoconch with extremely fine and dense microscopic spiral striæ; the following whorls strongly but irregularly radially striated, the striæ oblique, flexuous, retractive; interstices with a few fine growth-striæ and microscopic fine dense spiral lines. *Colour* white, blotched and marbled with reddish-brown on the spire-whorls, irregularly radially banded with lighter brown on the last whorl. *Epidermis* thin, membranous, slightly shining. *Spire* conoidal, obtuse, outlines nearly straight, its height not quite two-thirds that of the aperture. *Protoconch* of $1\frac{1}{4}$ whorls, convex. *Whorls* 5 to $5\frac{1}{2}$, slowly increasing, lightly convex, the last relatively high, more or less distinctly angled at the periphery; base convex. *Suture* impressed. *Aperture* rather oblique, rotundly lunate. *Peristome* thin, simple, regularly arched. *Columella* vertical, almost straight. *Inner lip* very little callous, reflexed above, and sometimes partly hiding the narrow deep umbilicus, which is about one-eighth of the minor diameter of the shell with 5 whorls.

Diameter—Maj., 10·25 mm.; min., 9 mm.: height, 7·8 mm.

Animal elongated, the foot long and narrow, reaching beyond the shell, rounded behind, slightly truncated, and with a mucous gland situated under a caudal papilla. Mantle subcentral, included; body roughish; peduncles long, cylindrical, approximated at their bases; tentacles moderate. Top of the head yellowish-white; peduncles, tentacles, and a line down each side of the head dark grey; a broad longitudinal band of white, with a dark-grey line in the centre, runs along each side, and below this band the foot is edged with alternate broad grey and narrow white bands. (Hutton.)

Jaw arcuate, with flattened plaits, which indent the concave margin.

Radula (Plate 1, fig. 14) with the formula 26 to 28 + 1 + 28 to 26; laterals about 16. Central tooth rectangular, longer than broad; the reflexed portion short, sharply constricted near the base, and with a small cutting-point. Laterals with the base oblique, the reflexed portion

bicuspid; the inner cusp single, but constricted near the base, and with a point; the outer cusp very oblique, notched at the end. Marginals broad, rounded at the ends, with numerous points, the inner one of which is much longer than the rest. (Hutton.)

Type in the Canterbury Museum, Christchurch.

Hab.—Waiau, Southland, type (G. M. Thomson); Waipara; Waitaki; Queenstown; Lake Guyon; Kaikoura Mountain, high up; Hossack Downs, Canterbury (E. Suter); Ashburton, on flax (W. W. Smith); Mount Somers (*ibid.*); Castle Rock, Southland (A. Hamilton); Invercargill (W. W. Smith); Stewart Island; Mount Linton.

Remarks.—It is common in limestone districts in the South Island. I am pretty sure that this species is not found in the North Island, and the specimens from localities in the North Island mentioned by Captain Hutton and myself are the nearly allied *T. decidua*.

7. Therasia Traversi, E. A. Smith, 1884. Plate 50, fig. 11.

Helix (*Thalassia*) *Traversi*, Sm., P.Z.S., 1884, 274, pl. 23, f. 16, *a*, *b*. *Charopa* (*Thalassia*) *Traversi*, Sm.: Tryon, Man. Conch. (2), ii, 214, pl. 63, f. 68–70. *Gerontia* (*Therasia*) *Traversi*, Sm.: Pilsbry, Man. Conch. (2), viii, 71. *Therasia Traversi*, Sm.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 641. *Flammulina* (*Therasia*) *Traversi*, Sm.: Man. Conch. (2), ix, 16; Suter, J. de Conch., xli, 247.

Shell depressed, subconoid, keeled, narrowly perforate, thin, corneous, somewhat glossy. *Sculpture:* Protoconch with microscopic distant radiate and indistinct fine spiral lines; the following whorls with fine arcuate oblique lines of growth, with additional microscopic radial fine lines, crossed by spiral striæ, first very close together, but getting more distant as growth and breadth of the whorls increase; they are present on the upper and under surfaces. *Colour* corneous, with fine light-red wavy and very oblique lines, retractive on the upper surface, but below the periphery of the last whorl they form suddenly a sharp angle and become protractive; they continue in light zigzag lines to the perforation. *Epidermis* thin, pellucid, shining. *Spire* depressed conoidal, lightly convex, about two-thirds the height of the aperture. *Protoconch* of $1\frac{3}{4}$ whorls, flattish. *Whorls* $5\frac{1}{2}$, rather slowly enlarging, a little convex, the last moderately sharply keeled; base convex. *Suture* moderately impressed. *Aperture* oblique, sublunate. *Peristome* thin, sharp. *Outer lip* angled; *basal lip* broadly rounded. *Columella* short, very oblique. *Inner lip* a little thickened, expanded and reflexed, continued as an inconspicuous transparent glaze over the convex parietal wall. *Perforation* narrow, deep, about one-tenth of the minor diameter in the adult, partly or nearly completely hidden by the columellar reflection.

Diameter — Maj., 11·5 mm.; min., 10 mm.: height, 7·5 mm. (type).

Dentition.—Suter, P.L.S. N.S.W. (2), viii, 490, pl. 22, f. 5*a*.

Jaw slightly arcuate, membranous, the ends bent slightly upwards. It is composed of numerous narrow nearly vertical plaits, partly overlying each other, broadly indenting the upper margin.

Radula tongue-shaped, the straight transverse rows consisting of 34 + 1 + 34 teeth, of which 14 are laterals. Central tooth quadrangular, somewhat longer than broad, with a triangular reflection, bearing 1 short median cutting-point, which does not extend to the posterior end of the base. Laterals slightly broader, bicuspid, the inner cusp much broader and longer than the anterior one, each of them being provided with a cutting-point, which shows a development corresponding to the reflection, but neither of them reaches to the posterior end of the base. A number of intermediate teeth are following, in which the base is getting shorter, the 2 cutting-points stouter and longer, extending beyond the base. Marginals short and broad, provided with 2 well-developed inner cutting-points, the outer posterior margin of the base bearing 3 to 4 small teeth or being simply indented. Last marginals rudimentary, quadrate, minute.

Type in the British Museum.

Hab.—North Island: Wairarapa, type (W. T. L. Travers); Rawene, Hokiangà (R. Murdoch); Auckland (H. S.); Ohaupo; Waikato (W. W. Smith); Mount Pirongia (T. Urquhart); Toko, near Stratford (R. Murdoch); Ngaputahi, Tuhoe-land (A. Hamilton); Forty-mile Bush (H. S.); Kaitaia (R. H. Matthews). South Island: Kenepuru (McMahon); Collingwood; Saddle Hill, Taieri (E. Suter).

Var. pallidula, Suter, 1892.

Thalassia neozelanica, forma *pallidula*, Sut., T.N.Z.I., xxiv, 1891 (1892), 272.

Shell very light corneous, without any colour-markings.

Type in my collection.

Hab.—Forty-mile Bush (H. S.).

8. Therasia Valeria, Hutton, 1883. Plate 9, fig. 8 *a*, *b*.

Therasia Valeria, Hutt., N.Z.J.S., i, 1883, 477; T.N.Z.I., xvi, 1883 (1884), 183, 202. *Gerontia* (*Therasia*) *Valeria*, Hutt.: Pilsbry, Man. Conch. (2), viii, 69, pl. 22, f. 46–48. *Therasia Valiera*, Hutt.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 640. *Flammulina* (*Therasia*) *Valeria*, Hutt.: Pilsbry, Man. Conch. (2), ix, 16; Suter, J. de Conch., xli, 246.

Shell globose-conoidal, depressed, finely ribbed, subperforate, thin and fragile. *Sculpture:* Protoconch microscopically very finely and closely spirally striate, the succeeding whorls radially finely ribbed, the riblets inequidistant and of somewhat unequal strength, oblique, retractive, sinuous over the periphery and extending to the perforation, about 15 per millimetre, the interstices with fine growth-lines and microscopic crowded spiral lines. *Colour* pale-horny, with numerous radial oblique zigzag bands of rufous, extending over the base.

Epidermis thin, not shining. *Spire* conoidal, obtuse, its height about two-thirds that of the aperture; outlines almost straight. *Protoconch* of 1½ shining convex whorls. *Whorls* 5, convex, gradually increasing, the last not descending, lightly angled at the periphery; base convex. *Suture* scarcely impressed. *Aperture* oblique, rotundly lunate. The *outer lip* sometimes lightly angled. *Peristome* simple, acute, thin. *Columella* short. *Inner lip* oblique, arcuate, slightly callous, reflexed above, and spreading as an extremely thin whitish glaze over the convex parietal wall. *Perforation* narrow, deep, about one-twelfth of the minor diameter, sometimes partly hidden by the reflection of the inner lip.

Diameter—Maj., 6·25 mm.; min., 5 mm.: height, 3·75 mm. (type).

Dentition.—Hutton, T.N.Z.I., xiv, 151, pl. 3, f. B (erroneously *P. hypopolia*); xvi, pl. ix, f. N.

Jaw arcuate, rounded at the ends, vertically finely plaited.

Radula with the formula 26 + 1 + 26; laterals 10 to 11. Central tooth tricuspidate, with a prominent mesocone and 2 minute ectocones. Laterals bicuspid, the inner cutting-point prominent and long. Marginals broad, with 4 cutting-points, the inner two strongest and sometimes coalesced. Last marginals bidentate.

Type in the Canterbury Museum, Christchurch.

Hab.—Dunedin, type (Captain Hutton); Riccarton Bush, near Christchurch; Dyer's Pass; Little River (H. S.); Akaroa (F. Suter); Bealey.

This species is confined to the South Island, and it is not common.

Genus 8. Phenacohelix. Suter, 1892.

Phenacohelix, Suter, T.N.Z.I., xxiv, 1891 (1892), 270. Type: *P. Ponsonbyi*, Suter. *Fruticicola*, Hutton, 1884; not of Held.

Animal elongate, the foot narrow, projecting behind the shell; mantle subcentral, rather anterior, included; eye-peduncles long, rather clavate; tentacles moderate. Caudal gland present.

Jaw arcuate, with numerous flat plaits indenting the concave margin.

Radula with the central tooth small, with or without side cusps; laterals similar, lacking entocones; marginals multicuspid, the inner cusp much larger.

Shell depressed, narrowly umbilicated, the spire slightly convex or conoidal, periphery broadly rounded; whorls finely ribbed, the protoconch smooth except for microscopic spiral striæ; aperture lunate; lip simple.

Distribution.—New Zealand.

Remarks.—The genus *Rhytidopsis*, Ancey, 1882, from New Caledonia, seems to be nearly allied, perhaps identical, but it is not known whether the animal has a caudal gland or not. The dentition seems to be similar.

KEY TO SPECIES.

A. Shell subperforate, perforation nearly closed; 8 riblets per millimetre .. .. *chordata.*
B. Shell narrowly perforate, perforation more or less open.
a. Perforation about one-twelfth of greatest diameter, open; 16 riblets per millimetre .. .. *subantarctica.*
aa. Perforation about one-sixth to one-seventh of greatest diameter.
b. Periphery obtusely shouldered; riblets 6 per millimetre; perforation one-sixth of greatest diameter, partly covered .. .. *leptalea.*
bb. Periphery rounded.
c. Riblets 8 per millimetre; height of spire one-half that of aperture; perforation 1 mm.; white within; diameter of shell 6·8 mm.. .. *perplexa.*
cc. Riblets 9, rarely 8 or 7, per millimetre; height of spire two-thirds that of aperture; perforation 0·5 mm.; diameter of shell 3·5 mm. .. *pilula.*
C. Shell moderately umbilicated; periphery angled above the middle.
a. Riblets 8, rarely 7 or 6, per millimetre; height of spire a little more than one-third that of aperture; umbilicus one-fifth of greatest diameter .. .. .. *Ponsonbyi.*
aa. Riblets 5 per millimetre, retractive; whorls slowly increasing; height of spire a little more than half that of aperture; umbilicus one-quarter of greatest diameter *Stokesi.*

1. **Phenacohelix chordata**, Pfeiffer, 1862. Plate 26, fig. 5, *a*, *b*.

Helix chordata, Pfr., Malak. Blätter, viii, 147; M.H. Viv., v, 72: Hector, Cat. Land Moll. N.Z., 6. *Xanina* (*Thalassia*) *chordata*, Pfr., Nomencl. Hel. Viv., 46. *Patula chordata*, Pfr.: Hutton, M.N.Z.M., 5. *Fruticicola chordata*, Pfr.: Hutton, T.N.Z.I., xvi, 194. *Phenacohelix chordata*, Pfr.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 642. *Flammulina* (*Phenacohelix*) *chordata*, Pfr.: Suter, J. de Conch., xli, 250.

Shell very small, globosely turbinated, subperforate, thin and fragile, not shining, semitransparent. *Sculpture* consisting of somewhat inequidistant cord-shaped radiate riblets, about 8 per millimetre; the interstices with numerous fine microscopic growth-lines, crossed by somewhat indistinct microscopic spiral lines, present also on the protoconch, which otherwise is smooth. *Colour* light horn marbled with fulvous, base usually tessellated. *Epidermis* very thin. *Spire* convexly conical, somewhat sharp, its height the same as that of the aperture. *Protoconch* arched, of 1½ whorls. *Whorls* 5, convex, the last slightly inflated at the base, periphery rounded. *Suture* impressed. *Aperture* a little oblique, lunar. *Peristome* simple, straight, margins remote. *Columella* short, vertical, somewhat arcuate. *Inner lip* slightly callous, somewhat reflected above over the very narrow perforation.

Diameter—Maj., 3·75 mm.; min., 3·6 mm.: height, 3 mm.

Animal unknown.

Type in the K.K. Hofmuseum, Vienna.

Hab.—New Zealand (Hochstetter); Whangarei; near Auckland; Motutapu Island (A. Suter); Ohaupo (T. Urquhart); Wanganui (R. Murdoch); Forty-mile Bush (H. S.); Nelson; Fortrose, Southland (Miss Rich).

Remarks.—This is a very rare species, but more often met with in the North Island. It is nearly allied to *P. pilula*, Reeve.

2. **Phenacohelix leptalea**, Suter, 1907. Plate 11, fig. 4.

Flammulina (*Phenacohelix*) *leptalea*, Sut., P. Mal. S., vii, March, 1907, 237, pl. 22, f. 4.

Shell small, subglobular, fragile, translucent, umbilicated, closely costate. *Sculpture* formed by radial riblets, about 6 per millimetre, straight above, slightly sinuate on the periphery and extending to the umbilicus; the costæ are thread-like, sharp; the interstices with numerous fine growth-lines, which are decussated by equally fine and close spiral lines. *Colour* light fulvous, with light zigzag markings of brown. *Epidermis* very thin, not shining. *Spire* broadly conoidal, with obtuse apex, its height about two-thirds that of the aperture. *Protoconch* of 1½ whorls, smooth, convex, microscopically finely and densely spirally striate. *Whorls* 4½, convex, regularly increasing, the last indistinctly shouldered, and with the periphery slightly flattened; base rounded. *Suture* deeply impressed. *Aperture* vertical, lunate. *Peristome* sharp and straight. *Outer lip* convex; *basal lip* somewhat flattened. *Columella* subvertical, concave, a little callous, and partly spread out over the umbilicus, which is moderate, deep; diameter, 0·7 mm.

Diameter—Maj., 4·5 mm.; min., 4 mm.; height, 3·7 mm.

Animal unknown.

Type in my collection.

Hab.—Kaihu, Hokianga, type (Strickland); Waitakerei Range; Waiwera (H. S.); Whangarei (A. Suter).

Remarks.—This species is closely related to *P. Ponsonbyi*, Suter, but is smaller, much more globose and fragile, the colour-markings are generally of a different pattern, the riblets more distant, and the umbilicus a little narrower.

3. **Phenacohelix perplexa**, Murdoch, 1897. Plate 26, fig. 6, *a*, *b*.

Flammulina (*Phenacohelix*) *perplexa*, Murd., P. Mal. S., ii, 161, figs. in text.

Shell globosely depressed, umbilicated, thin, not shining, semi-transparent, finely costate. *Sculpture* formed by slightly unequal and somewhat inequidistant radiate sharp riblets, about 8 per millimetre, sloping slightly backward on the upper surface, a little undulating at the periphery, straight on the base; interstices with fine growth-lines, more or less distinctly reticulated by microscopic spiral lines. *Colour* pale brown, base occasionally darker, spotted and reticulated with reddish-brown, the reticulations frequently extending

over the whole shell, most developed on the upper surface, usually a few larger spots near the suture. *Epidermis* thin, dull. *Spire* depressed conoidal, outlines slightly convex, its height about half that of the aperture. *Protoconch* flatly convex, smooth, sometimes indistinctly radially costate, of $1\frac{3}{4}$ whorls. *Whorls* 5, convex, gradually increasing, body-whorl rounded, higher than broad (slightly angulated in the young), not descending. *Suture* impressed. *Aperture* oblique, rotundly lunate. *Peristome* simple, straight, margins slightly approaching. *Columella* oblique, arcuate. *Inner lip* slightly thickened, and rather broadly dilated above, white. *Umbilicus* deep, about 1 mm. in diameter, usually whitish within.

Diameter—Maj., 6·8 mm.; min., 5·5 mm.: height, 4·5 mm.

Dentition typical.

Type unfortunately destroyed by fire, but co-types are in my collection.

Hab.—Wanganui; Cape Egmont (R. Murdoch).

Remarks.—This species resembles very much the local variety of *Phacussa hypopolia*, Pfr., from Pelorus Valley, and no well-marked characters separate the shells of the two, but the dentition of the two species is quite distinct.

4. Phenacohelix pilula, Reeve, 1852. Plate 26, fig. 7, *a*, *b*.

Helix pilula, Reeve, Conch. Icon., vii. sp. 809. *Phenacohelix pilula*, Reeve: Hedley and Suter, P.L.S. N.S.W. (2), vii, 641. *Flammulina* (*Phenacohelix*) *pilula*, Reeve: Suter, J. de Conch., xli, 249; P. Mal. S., ii, 284, figs. in text. *Helix iota*, Pfeiffer, M.H. Viv., iii, 1853, 69; P.Z.S., 1852 (1854), 57. *H.* (*Charopa*) *iota*, Pfr.: Hector, Cat. Land Moll. N.Z., 8. *Patula iota*, Pfr.: Hutton, M.N.Z.M., 6. *P.* (*Charopa*) *iota*, Pfr., Nomencl. Hel. Viv., 97. *Charopa* (*Thalassia*) *iota*, Pfr.: Tryon, Man. Conch. (2), ii, 212, pl. 62, f. 43. *Phenacohelix granum*, Pfr.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 642; not of Pfeiffer.

Shell very small, globose, perforated, thin and fragile, not shining, finely costate. *Sculpture* consisting of fine microscopic spiral striæ on the protoconch and all the other whorls, close and fine radial riblets on the post-nuclear whorls, about 9 per millimetre, but in some specimens only 8 or 7 are present; the interstices microscopically finely decussated; the riblets are straight above, slightly sinuated on the periphery and base. *Colour* yellowish-horny, with rufous spots on the upper surface, faint reddish zigzag lines on the periphery and base. *Epidermis* thin, translucent. *Spire* shortly conoidal, outlines convex, its height about two-thirds that of the aperture. *Protoconch* of $1\frac{1}{2}$ whorls, the nucleus slightly elevated. *Whorls* 5, rather convex, gradually increasing, the last not descending, rounded. *Suture* impressed. *Aperture* a little oblique, rotundly lunar. *Peristome* simple, straight, margins distant. *Columella* short, arcuate. *Inner lip* slightly thickened, but slightly reflexed above. *Umbilicus* narrow, deep, always open, its diameter about 0·5 mm.

Diameter—Maj., 3·5 mm. : min., 3·25 mm. : height, 2·5 mm. (type).

Animal unknown.

Type in the British Museum.

Hab.—North Island : Whangarei ; Mount Wellington ; Hunua Range (Major Broun) ; Tuakau ; Waimarama ; Forty-mile Bush (H. S.). Stewart Island : Half-moon Bay (A. Hamilton).

5. Phenacohelix Ponsonbyi, Suter, 1897. Plate 26, fig. 8, *a*, *b*.

Flammulina (*Phenacohelix*) *Ponsonbyi*, Sut., P. Mal. S., ii, 285, figs. in text. *Patula pilula*, Reeve : Hutton, T.N.Z.I., xvi, 161. *Fruticicola pilula*, Reeve : Hutton, *t.c.*, 194. *Phenacohelix pilula*, Reeve : Hedley and Suter, P.L.S. N.S.W. (2), vii, 641. *Flammulina* (*Phenacohelix*) *pilula*, Reeve : Suter, J. de Conch., xli, 249 (in part) ; Pilsbry, Man. Conch. (2), ix, 16, pl. 3, f. 13 ; not of Reeve.

Shell small, depressed globose, moderately umbilicated, thin and fragile, dull. *Sculpture* consisting of numerous arcuate, subequidistant thread-like riblets, about 8, rarely 7 or 6, per millimetre ; all the whorls microscopically spirally finely striated, the post-nuclear whorls with fine interstitial growth-lines, decussating the spirals. *Colour* pale-horny with irregular radiate dashes and spots of rufous on the upper surface, passing over in zigzag lines at the base, sometimes imparting a tessellated appearance to it, and extending to the umbilicus. *Epidermis* thin, semitransparent. *Spire* very little elevated, very broadly conoidal, its height slightly more than one-third that of the aperture. *Protoconch* of 1½ convex whorls. *Whorls* 4½, regularly increasing, flatly convex, periphery obtusely angled above the middle ; base convex. *Suture* impressed. *Aperture* oblique, rotundly lunate. *Peristome* thin, straight, regularly arched. *Columella* oblique, arcuate. *Inner lip* slightly callous and reflexed. *Umbilicus* quite open, somewhat perspective, about one-fifth of the greatest diameter.

Diameter—Maj., 6 mm. ; min., 5·25 mm. : height, 3·25 mm.

Anatomy.—Hutton, T.N.Z.I., xvi, 161, pl. 9, f. K ; pl. 11, f. M : Pilsbry, Man. Conch. (2), ix, pl. 2, f. 6, 7 : Murdoch, P. Mal. S., iii, 322, pl. 16, f. 9–11 (all as *P. pilula*).

Jaw arcuate, with about 35 flat plaits, which indent the concave but not the convex margin.

Radula having the formula 27 + 1 + 27, varying from 25 to 29 ; laterals from 13 to 15. Central tooth small, narrower in front than behind, longer than broad, the reflexed portion constricted at the sides, covering about half the base, with a rather large acute point. First lateral like the central, but larger ; the other laterals with a deep notch at the outer side of the reflexed portion, the cutting-point increasing in length outwards. Marginals broader than long, the inner with a cutting-point and a denticle on each side of it ; the outer serrated, one of the inner points longer than the others. (Hutton.)

Type in my collection.

Hab.—North Island: Whangarei (Musson); Waitakerei Range (H. S.); Little Barrier Island (R. Buddle); Motutapu Island (A. Suter); Waiheke Island (H. S.); Mount Wellington lava-fields, type (H. S.); Hillyer's Creek (Musson); Hunua Range (Major Broun); Tuakau; Ohaupo; Mount Taupiri (Urquhart); Forty-mile Bush (H. S.); Otaki Gorge (Preston); Wanganui (R. Murdoch).

Remarks.—The species resembles *Allodiscus Mossi*, Murdoch, which, however, has a much narrower umbilicus.

Var. **unicolor**, Suter, 1894.

P. pilula, Reeve, var. *unicolor*, Suter, T.N.Z.I., xxvi, 134.

Shell the same as in the species, uniformly light brown, without any colour-markings.

Type in my collection.

Hab.—Mount Taupiri (A. T. Urquhart).

6. **Phenacohelix Stokesi**, E. A. Smith, 1884. Plate 26, fig. 9, *a*, *b*.

Helix (*Patula*) *Stokesi*, Sm., P.Z.S., 1884 (6, v), 275, pl. 23, f. 17–17*b*; Man. Conch. (2), iii, 262, pl. 22, f. 48–50. *Patula Lucetta*, Hutton, T.N.Z.I., xvi, 162, 192. *Helix* (*Patula*) *Lucetta*, Hutt., Man. Conch. (2), iii, 22, pl. 3, f. 7–9. *Charopa Lucetta*, Hutt.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 654. *Endodonta* (*Charopa*) *Lucetta*, Hutt.: Suter, J. de Conch., xli, 268. *Flammulina* (*Phenacohelix*) *Lucetta*, Hutt.: Murdoch, P. Mal. S., iii, 1899, 323.

Shell depressed, moderately umbilicated, thin and fragile, with fine costæ, translucent, not shining. *Sculpture* consisting of numerous arcuate radiating retractive thread-like riblets, about 5 per millimetre, on the post-nuclear whorls; interstices with fine growth-lines, decussated by exceedingly fine crowded microscopic spiral lines, extending over all the whorls, but very indistinct on the embryonic whorls. *Colour* pale yellow, irregularly spotted and variegated with reddish subradiating markings above, and dotted and streaked beneath with a lighter tint. *Epidermis* thin and dull. *Spire* depressed conoidal, its height a little more than half that of the aperture. *Protoconch* of $1\frac{1}{2}$ whorls, smooth and glossy. *Whorls* 6, convex, slowly increasing, periphery of last whorl obtusely angled or shouldered above the middle; base flatly rounded. *Suture* deep. *Aperture* obliquely lunate. *Peristome* thin, straight. *Outer lip* acutely convex; *basal lip* more broadly rounded. *Columella* very short, subvertical, arcuate. *Inner lip* somewhat callous and very slightly reflexed above. *Umbilicus* moderate, deep and perspective, about one-fourth of the greatest diameter.

Diameter—Maj., 7·5 mm.; min., 6·5 mm.: height, 4 mm. (type).

Animal and Anatomy.—Murdoch, P. Mal. S., iii, 323, pl. 16, f. 12–14.

Animal having the characteristic suprapedal grooves, a narrow foot, and caudal mucous pore with small papilla.

Jaw consists of about 33 narrow plaits, slightly overlapping at the sides and indenting the concave margin ; under a high power they are seen to be strengthened by transverse waved striæ.

Radula (Plate 1, fig. 15) having the formula 8 + 18 + 1 + 18 + 8, in numerous transverse nearly straight rows. The teeth are very similar to the preceding species.

Reproductive Organs (Plate 1, fig. 15).—Male organ with the retractor muscle at the apex ; the vas deferens forms a slender tube, it unites with the verge in a small papilla a little below the apex, separating from the oviduct at the base of the enveloping sac or lobe ; the spermatheca situate somewhat high on the oviduct, tapering, the upper half slender, with a globose termination. The hermaphrodite gland, albumen-gland, and enveloping sac are similar to the preceding species.

The dentition of *Patula Lucetta* (Hutt., T.N.Z.I., xvi, 162, pl. 11, f. A.) is undoubtedly that of *Endodonta coma globosa*, the shell of which resembles *P. Stokesi* (= *Lucetta*).

Type in the British Museum.

Hab.—North Island : Wairarapa, type (W. T. Locke Travers) ; Hawke's Bay, type of *P. Lucetta* (W. Colenso) ; Ormondville ; Dannevirke (Brooks) ; Forty-mile Bush (H. S.) ; Paekakariki (A. Hamilton) ; Wellington (H. S.). South Island : Kenepuru (McMahon) ; Wairoa Gorge (Meeson) ; Greymouth (R. Helms).

Remarks.—The species closely resembles *Endodonta coma*, Gray, but is more narrowly umbilicated, just a trifle more finely costate, and has the body-whorl roundly angulated above the middle. Mr. E. A. Smith's name has, no doubt, priority ; moreover, good figures of the species are given.

7. Phenacohelix (?) subantarctica, Suter, 1909. Plate 26, fig. 10, *a*, *b*.

Phenacohelix (?) *subantarctica*, Suter, Subantarct. Islds. N.Zeal., i, 1909, 36, pl. 1, f. 9–11.

Shell very small, depressed globose, perforated, finely costate, thin and very fragile, with radiate whitish and brown streaks. *Sculpture* consisting of somewhat flexuous subequidistant fine radiate riblets, about 16 per millimetre ; the interstices with numerous very fine incremental lines, decussated by microscopic spiral striæ. *Colour* yellowish-white, upper surface with somewhat unequal light-brown radiate streaks ; base uniformly brown. *Epidermis* thin, horny, not shining. *Spire* low, broadly conoidal, with blunt apex, its height a little less than that of the aperture ; outlines slightly convex. *Protoconch* flattish, of $1\frac{1}{2}$ very lightly rounded whorls, which are indistinctly microscopically spirally striated. *Whorls* 4, regularly increasing, moderately convex, the last very lightly angled at the periphery ; base convex. *Suture* impressed. *Aperture* lunate, angled above. *Peristome* sharp, thin. *Outer lip* convex, subangled ; *basal lip* broadly

rounded. *Columella* short, vertical, arcuate, slightly reflexed above. *Umbilicus* narrow, perfectly open, pervious.

Diameter, 3 mm. ; height, 2·1 mm.

Animal unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—Campbell Island, mostly on *Dracophyllum*, not uncommon (W. K. Chambers).

Remarks.—I used six dried-up animals for preparing the jaw and radula, but, curiously enough, I was unable to find a trace of these organs ; they, no doubt, were only remnants of the animals. The generic position of the species therefore remains somewhat uncertain, but the characters of the shell are those of *Phenacohelix*, and, in a much lesser degree, of *Allodiscus*.

Genus 9. Suteria, Pilsbry, 1892.

Suteria, Pilsbry, "The Nautilus," Sept. 5, 1892, 56. Type : *Helix Ide*, Gray. *Charopa*, Hutton, 1884 ; not of Albers, 1860. *Patulopsis*, Suter, 1891 ; not of Strebel, 1879. *Suteria*, Pils., Man. Conch. (2), ix, 17.

Animal rather short and narrow ; mantle subcentral, rather anterior, slightly reflexed over the peristome of the shell ; foot narrow, extending behind the shell ; tail truncated, and furnished with a mucous gland ; no locomotive disc. Eye-peduncles very long, cylindrical, approximate at their bases ; tentacles long. (Hutton.)

Jaw with 30 flat plaits, each transversely striated.

Dentition : Central tooth tricuspid, the mesocone long, ectocones short and constricted on the outer sides. Lateral teeth similar, but the entocone smaller than the ectocone. Inner marginals with 1 bifid cusp, the outer with several subequal cusps.

Shell thin and rather opaque, openly umbilicated, discoidal, the spire flat ; periphery broadly rounded ; surface having low spirals, and radial undulating cuticular lamellæ bearing hairs : lip thin, simple.

Distribution.—New Zealand ; a single species.

1. **Suteria Ide**, Gray, 1850. Plate 26, fig. 11, *a*, *b*.

Helix Ide, Gray, P.Z.S., 1849 (1850), 166 ; A.M.N.H. (2), vii, 66 ; Pfeiffer, M.H. Viv., iii, 108 ; Conch. Cab. (2), i, 460, pl. 155, f. 34–36 ; Conch. Icon., vii, pl. 130, f. 789. *H.* (*Charopa*) *Ide*, Gray : Hector, Cat. Land Moll. N.Z., 13. *Patula* (*Charopa*) *Ide*, Gray, Nomencl. Hel. Viv., 98. *P. Ide*, Gray : Hutton, M.N.Z.M., 9. *Charopa Ida*, Gray : Hutton, T.N.Z.I., xvi, 200 ; Tryon, Man. Conch. (2), ii, 210, pl. 62, f. 32–34. *Suteria Ide*, Gray : Hedley and Suter, P.L.S. N.S.W. (2), vii, 642. *Flammulina* (*Suteria*) *Ide*, Gray : Suter, J. de Conch., xli, 254 ; Pilsbry, Man. Conch. (2), ix, 17, pl. 3, f. 24–26.

Shell small, discoidal, umbilicated, pilose, thin, but very faintly shining. *Sculpture* of the post-nuclear whorls consisting of radial undulating cuticular lamellæ, about 3 per millimetre, bearing long thin cylindrical hairs ; the interstices with minute crowded and

wavy growth-striæ, crossed by indistinct microscopic spiral lines; low and rather distant spirals are clearly visible on the base, but mostly indistinct on the upper surface; the hairs are produced at the crossing-points of these with the radial riblets. *Colour* pale brown, radiated with narrow undulating bands of blackish-brown. *Epidermis* thin, horny, easily peeling off. *Spire* perfectly flat. *Protoconch* of $1\frac{1}{2}$ convex and shining whorls, with microscopic indistinct radial lines. *Whorls* $5\frac{1}{2}$, the first three very slowly increasing, convex, periphery broadly convex; base flatly rounded. *Suture* deep. *Aperture* slightly oblique, triangularly lunate. *Peristome* simple, straight. *Outer lip* advancing above, retractive toward the suture with a distinct sinus; *basal lip* flattish. *Columella* short, oblique, arcuate. *Inner lip* slightly callous, very little reflexed, spreading broadly as a very thin shining glaze over the convex parietal wall. *Umbilicus* quite open, deep, slightly perspective, about one-fifth of the major diameter.

Diameter—Maj., 8 mm.; min., 7 mm.; height, 4 mm.

Animal and Dentition (Hutton, T.N.Z.I., xvi, 164).—Radula with the formula $22+1+22$; laterals about 8.

Type in the British Museum.

Hab.—North Island: Whangaroa (C. Cooper); Great and Little Barrier Islands; Waiheke Island (H. S.); Thames; Hillyer's Creek; Ohaupo; Maketu; Mamaku; Mount Pirongia; Heretaunga; Toko; Midhirst; Ngaputahi, Tuhoe-land (A. Hamilton); Forty-mile Bush; Wellington (H. S.). South Island: Kenepuru; Wairoa Gorge; Birch Hill, Nelson; Collingwood; Greymouth; Capleston; near Lake Mahinapua (Professor Dendy).

Genus 10. Flammulina, Martens. 1873.

Flammulina, Mts., Crit. List, 12; Pilsbry, Man. Conch. (2), ix, 1894, 17. Type: *Helix phlogophora*, Pfeiffer. *Amphidoxa* of New Zealand authors; not of Albers, 1850. *Calymna*, Hutton, 1884; not of Hübner, 1816.

Animal carrying the shell subcentrally, mantle-edge slightly reflected over the peristome of the shell, with an even margin; tail depressed, rounded, with a mucous gland.

Jaw delicate, arcuate, with numerous vertical plaits.

Radula with the mesocone of the central tooth well developed, ectocones small or wanting; lateral teeth similar to the central; marginal teeth usually tricuspid, sometimes with 4 cusps, in some species the cusps coalescing on the outer teeth.

Shell narrowly umbilicated or imperforate, globose or depressed, thin, fragile, subpellucid, composed of a few rapidly widening whorls, which are either smooth and glossy or ribbed; aperture large, rounded lunar; lip thin, simple, slightly expanded at the columellar insertion.

Distribution.—New Zealand, Tasmania, Lord Howe Island, Norfolk Island; Ponapé, Carolines.

KEY TO SPECIES.

A. Shell with radial riblets.
  a. Shell openly umbilicated.
    b. Riblets 3 to 4 per millimetre, microscopic spiral lines indistinct; umbilicus one-fifth of greatest diameter. Dimensions, 6 mm. by 3 mm., with $3\frac{1}{2}$ whorls .. .. *Chiron.*
    bb. Riblets about 20 per millimetre, microscopic spiral lines distinct; umbilicus one-third of greatest diameter. Dimensions, $2\frac{2}{4}$ mm. by 1 mm., with 4 whorls .. .. *Pilsbryi.*
  aa. Shell narrowly perforated.
    b. Riblets 25–30 per millimetre, microscopically spirally striate; spire half the height of aperture. Dimensions, $3\frac{1}{2}$ mm. by $2\frac{1}{4}$ mm., with $3\frac{1}{2}$ whorls.. *costulata.*
    bb. Riblets 10 per millimetre, a few spiral grooves on upper surface; spire three-quarters the height of aperture. Dimensions, 5 mm. by $3\frac{1}{2}$ mm., with 3 whorls .. .. *olivacea.*
  aaa. Shell imperforate.
    b. Riblets about 10–12 per millimetre .. .. *Feredayi.*
    bb. Riblets about 25 per millimetre .. .. *glacialis.*
B. Shell without radial riblets, growth-striæ only.
  a. Shell openly umbilicated.
    b. With microscopic spiral lines, no colour-markings; suture margined; umbilicus one-quarter of greatest diameter. Dimensions, 8 mm. by $3\frac{1}{2}$ mm., with $4\frac{1}{2}$ whorls .. .. .. *alpina.*
    bb. No spiral lines, with brown zigzag bands; suture simple; umbilicus two-fifths of greatest diameter. Dimensions, 7 mm. by 3 mm., with $3\frac{1}{2}$ whorls .. .. *crebriflammis.*
  aa. Shell narrowly perforated.
    b. Minutely reticulated; spire flat; last whorl sharply keeled .. .. *Jacquenetta.*
    bb. With growth-lines only; height of spire three-quarters that of aperture; periphery convex .. *Perdita.*
  aaa. Shell imperforate, or only very narrowly subperforated.
    b. No colour-markings, uniformly horny; spire very low.
      c. Suture false-margined, crenate by growth-striæ, with traces of microscopic spiral lines. Dimensions, $9\frac{1}{2}$ mm. by $3\frac{1}{2}$ mm., with 4 whorls *compressivoluta.*
      cc. Suture simple, no microscopic spirals. Dimensions, $6\frac{1}{4}$ mm. by $4\frac{1}{2}$ mm., with 3 whorls.. *cornea.*
    bb. With brown zigzag markings; height of spire two-fifths that of aperture. Dimensions, 7 mm. by $3\frac{1}{2}$ mm., with $3\frac{1}{2}$ whorls .. .. .. *phlogophora.*

1. **Flammulina alpina**, Suter, 1904. Plate 26, fig. 12, *a*, *b*.

Flammulina alpina, Sut., "Index Faunæ Novæ-Zealandiæ," 62. *Amphidoxa corneo-fulva*, Pfr.: Suter, T.N.Z.I., xxiv, 1891 (1892), 287, pl. 20, f. 5, 6. *Flammulina corneo-fulva*, Pfr.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 644; Suter, J. de Conch., xli, 240; not of Pfeiffer.

Shell small, suborbicular, umbilicated, smooth, shining, pellucid. *Sculpture* consisting of oblique curved and retractive growth-striæ, more prominent toward the suture, and minute dense microscopic fine

spiral lines, visible only under a powerful lens. *Colour* light greenish-yellow above, base more whitish. *Epidermis* thin, transparent, polished. *Spire* very low, broadly convex, its height not quite half that of the aperture. *Protoconch* flat, not marked off from the succeeding volutions. *Whorls* 4½, the last two more rapidly increasing than the others, convex, periphery acutely rounded; base more flattish. *Suture* lightly impressed, margined on the outer side. *Aperture* somewhat oblique, ovately lunate, broader than high. *Peristome* thin and sharp, straight, retractive from the suture to the base. *Outer lip* very sharply rounded. *Columella* very short, arcuate, slightly reflexed above. *Umbilicus* open, perspective, about one-quarter of the greatest diameter.

Diameter—Maj., 8 mm.; min., 6·5 mm.: height, 3·5 mm. Aperture—Height, 2·5 mm.; breadth, 3·5 mm.

Jaw membranous, slightly arcuate, with numerous vertical plaits indenting the cutting-edge.

Radula having the formula $140 \times 17 + 16 + 1 + 16 + 17$. Central tooth with a stout mesodont; the first laterals similar to the central, but in the outer teeth the mesodont is becoming broad and short, and a small ectodont appears; marginals tricuspid, the median cusp strongest.

Type in my collection.

Hab.—Head of Staircase Creek, 5,300 ft. altitude, on Nerger Range, Canterbury, in slush of snow, hundreds together (G. F. Roberts); March, 1884.

2. **Flammulina Chiron**, Gray, 1850. Plate 26, fig. 13, *a*, *b*.

Zonites Chiron, Gray, P.Z.S., 1849 (1850), 166; A.M.N.H. (2), vii, 66. *Helix Chiron*, Gray: Pfeiffer, M.H. Viv., iii, 94; Reeve, Conch. Icon., vii, pl. 131, f. 797. *H.* (*Paryphanta*) *Chiron*, Gray: Hector, Cat. Land Moll. N.Z., 10. *Nanina* (*Paryphanta*) *Chiron*, Gray: Pfeiffer, Nomencl. Hel. Viv., 35. *Paryphanta Chiron*, Gray: Hutton, M.N.Z.M., 23. *Amphidoxa Chiron*, Gray: Hutton, T.N.Z.I., xvi, 199; Suter, T.N.Z.I., xxiv, 289, pl. 20, f. 10. *Elæa Chiron*, Gray: Tryon, Man. Conch. (2), i, 129, pl. 26, f. 19. *Flammulina Chiron*, Gray: Hedley and Suter, P.L.S. N.S.W. (2), vii, 644; Suter, J. de Conch., xli, 239.

Shell small, depressed, arcuately plaited or ribbed, umbilicated, shining, thin and fragile, pellucid. *Sculpture* on the post-nuclear whorls consisting of arcuate slightly retractive plaits or sharp membranous riblets, 3 to 4 per millimetre, the interstices with a few growth-striæ and sometimes indistinct microscopic fine and close spiral lines. *Colour* fuscous-olive, sometimes with light-brown simple or zigzag bands following the direction of the riblets. *Epidermis* very thin, transparent, and glossy. *Spire* very little elevated, nearly flat. *Protoconch* of 1 smooth convex whorl. *Whorls* 3 to 3½, rather convex, rapidly increasing, the last subdepressed, periphery rounded; base convex. *Suture* well impressed. *Aperture* a little oblique, sublunately rotund. *Peristome* thin, the right margin somewhat bent backwards.

separated from the last whorl by a slight incision. *Columella* vertical, arcuate. *Inner lip* very little thickened, widely opened out or reflexed above. *Umbilicus* moderate, pervious, showing all the whorls, about one-fifth of the greatest diameter.

Diameter—Maj., 6 mm.; min., 5 mm.: height, 3 mm. (type).

Dentition.—Hutton, T.N.Z.I., xvi, 171, pl. x, f. B (*Paryphanta Chiron*); Suter, T.N.Z.I., xxiv, 289, pl. 20, f. 11, 12 (*Amphidoxa Chiron*); Man. Conch. (2), ix, pl. 2, f. 17, 18.

Jaw arcuate, membranous, with about 15 vertical plaits, separated from one another.

Radula (Plate 1, fig. 16) having the formula $110 \times 12+5+1+5+12$. Central tooth rectangular, tricuspid, the middle cusp long. Laterals somewhat larger, tricuspid, the mesocone long, the entocone larger than the ectocone. Marginals tridentate, the middle tooth broad, short, the inner one longer and narrower, the outer one short. Towards the margin the denticles coalesce by degrees into one mass, the last rudimentary.

Type in the British Museum.

Hab.—Auckland, type (Greenwood); Whangaroa (C. Cooper); Hillyer's Creek; Mount Wellington; Ohaupo (Musson); Thames (Adams); Waitakerei Range (H. S.); Tuakau; Wairangi (A. Suter); Hunua Range (Major Broun); Seventy-mile Bush; Forty-mile Bush (H. S.); near Wellington.

Remark.—The species is not recorded from the South Island.

3. Flammulina compressivoluta, Reeve, 1852. Plate 26. fig. 14, *a*, *b*.

Helix compressivoluta, Reeve, Conch. Icon., vii, pl. 130, f. 791. *Amphidoxa compressivoluta*, Reeve: Hutton, T.N.Z.I., xvi, 198. *Flammulina compressivoluta*, Reeve: Hedley and Suter, P.L.S. N.S.W. (2), vii, 643; Suter, J. de Conch., xli, 238. *Helix omega*, Pfeiffer, M.H. Viv., iii, 1853, 33; P.Z.S., 1852 (1854), 56. *H.* (*Paryphanta*) *omega*, Pfr.: Hector, Cat. Land Moll. N.Z., 4. *Nanina* (*Paryphanta*) *omega*, Pfr., Nomencl. Hel. Viv., 35. *Patula omega*, Pfr.: Hutton, M.N.Z.M., 10. *Paryphanta omega*, Pfr.: Tryon, Man. Conch. (2), i, 128, pl. 26, f. 28.

Shell small, depressed, imperforate, almost smooth, thin, shining, pellucid. The only *sculpture* consists of oblique retractive growth-striæ, more distinct outside the suture, somewhat crenulating the margin; a high magnifying-power reveals traces of spiral lines. *Colour* light fuscous-horny, the nucleus slightly reddish. *Epidermis* thin, transparent, polished. *Spire* low, broadly convex. *Protoconch* of $1\frac{1}{2}$ convex whorls, flat and smooth. *Whorls* 4, flatly convex, rapidly increasing, periphery acutely convex; base flatly rounded, impressed in the middle. *Suture* impressed, false-margined on the outer side. *Aperture* oblique, lunately oval, broader than high. *Peristome* simple, straight, sharp. *Outer lip* narrowly rounded. *Columella* very short, oblique, and arcuate. *Inner lip* slightly callous, reflexed above, adnate in the umbilical region; parietal wall with a thin glaze.

Diameter—Maj., 9·5 mm. ; min., 7 mm. : height, 3·5 mm. (type).

Dentition.—Suter, T.N.Z.I., xxiv, 288, pl. 20, f. 8, 9 (*Amphidoxa compressivoluta*).

Jaw almost straight, membranous, with very fine vertical striæ.

Radula with the formula $100 \times 32 + 1 + 32$; laterals about 6. Central tooth tricuspid ; laterals similar, but the entocone larger than the ectocone ; marginals with 3 to 4 denticles, the second on the inner side strongest.

Type in the British Museum.

Hab.—North Island : Heretaunga (Brooks) ; Shannon (R. Murdoch) ; Petane, near Napier ; Forty-mile Bush (H. S.) ; near Wellington (H. S.).

Remarks.—Hutton mentions the locality Greymouth, but I think the specimens sent to him by R. Helms were those I gave to the latter, coming from the Forty-mile Bush.

4. **Flammulina cornea,** Hutton, 1883. Plate 9, fig. 9, *a*, *b*.

Amphidoxa cornea, Hutt., T.N.Z.I., xv, 1882 (1883), 136 ; T.N.Z.I., xvi, 198. *Gerontia* (*Calymna*) *cornea,* Hutt : Pilsbry, Man. Conch. (2), viii, 75, pl. 22, f. 64–66. *Flammulina cornea,* Hutt. : Hedley and Suter, P.L.S. N.S.W. (2), vii, 643 ; Suter, J. de Conch., xli, 240.

Shell small, depressed, imperforate, striated, translucent. *Sculpture* formed by oblique arcuate and retractive growth-lines only ; there are no spirals. *Colour* pale-horny. *Epidermis* thin, polished. *Spire* low, broadly convex. *Protoconch* of 1 convex whorl, smooth. *Whorls* $2\frac{1}{2}$ to 3, rapidly increasing, rounded, periphery convex ; base somewhat impressed in the middle. *Suture* impressed. *Aperture* oblique, ovately lunate. *Peristome* thin, regularly arched, straight. *Columella* short, slightly oblique, and arcuate. *Inner lip* a little callous, shortly reflexed above, and extending as a thin glaze over the convex parietal wall.

Diameter—Maj., 6·25 mm. ; min., 5 mm. : height, 4·5 mm.

Radula with the formula $17 + 1 + 17$; laterals 8.

Type in the Canterbury Museum, Christchurch.

Hab.—Auckland (Cheeseman, Gillies).

Remarks.—The species is very nearly allied to the foregoing, but the whorls are more convex, the suture is not false-margined and crenulated, and the shell is smaller ; there is also no trace of spiral striation.

5. **Flammulina costulata,** Hutton, 1883. Plate 26, fig. 15, *a*, *b*.

Amphidoxa costulata, Hutt., T.N.Z.I., xv, 1882 (1883), 136. *A.* (*Calymna*) *costulata,* Hutt., T.N.Z.I., xvi, 199. *Gerontia* (*Calymna*) *costulata,* Hutt. : Pilsbry, Man. Conch. (2), viii, 73, ix, pl. 3, f. 20–22. *Flammulina* (*Calymna*) *costulata,* Hutt. : Hedley and Suter, P.L.S. N.S.W. (2), vii, 645 ; Suter, J. de Conch., xli, 241.

Shell very small, depressed, perforated, somewhat shining, very finely ribbed, thin and fragile. *Sculpture* consisting of microscopic

fine spiral lines on all whorls, the post-nuclear whorls with flexuous very fine and close riblets, about 25 to 30 per millimetre; the interstices reticulated by fine growth-lines and spirals. *Colour* pale-horny, radially banded with reddish-brown, forming sometimes zigzag lines; base uniformly brown; sometimes the bands are absent on the last half of the body-whorl. *Epidermis* very thin, with a silky lustre. *Spire* little elevated, conoidal, its height about half that of the aperture. *Protoconch* of $1\frac{1}{2}$ convex whorls, with spiral striæ only. *Whorls* $3\frac{1}{2}$, rapidly increasing, rounded; base convex. *Suture* impressed. *Aperture* oblique, ovately lunate. *Peristome* thin, straight, regularly arched. *Basal lip* somewhat flattened. *Columella* short, oblique, arcuate. *Inner lip* reflexed above and partly covering the narrow perforation, which is preceded by a broad funnel-shaped depression.

Diameter—Maj., 3·6 mm.; min., 3 mm.: height, 2·2 mm.

Dentition (Hutton, T.N.Z.I., xvi, 171, pl. 10, f. D).—Formula of teeth 14+1+14.

Type in the Canterbury Museum, Christchurch.

Hab. — Auckland, type (Cheeseman); Whangarei (A. Suter); Thames (Adams); Kawau Island (Miss F. Suter); Hunua Range (Major Broun); Ohaupo (Musson); Hawke's Bay (W. Colenso); Seventy-mile Bush; near Waitomo Caves (A. Hamilton); Toko, near Stratford (R. Murdoch). Not recorded from the South Island.

Subsp. parva, Suter, 1909.

Flammulina costulata parva, Sut., P. Mal. S., viii, 1909, 259.

Distinguished from the species by the following characters: The shell is smaller, subdiscoidal, and moderately umbilicated; the sculpture is the same, but the spirals on the protoconch are very faint; colour and colour-markings very similar, the brown streaks, however, extend usually over the base; the spire is very little raised: the umbilicus is moderate, deep, its diameter being 0·6 mm.

Diameter—Maj., 2·9 mm.; min., 2·4 mm.: height, 1·3 mm.

Animal unknown.

Type in my collection.

Hab.—Henderson, in native bush amongst mould (H. S.).

6. Flammulina crebriflammis, Pfeiffer, 1853. Plate 26, fig. 16, *a*, *b*.

Helix crebriflammis, Pfr., M.H. Viv., iii, 1853, 91; P.Z.S., 1852 (1854), 148; Conch. Cab. (2), i, 456, pl. 155, f. 5–8; Reeve, Conch. Icon., vii, pl. 131, f. 805. *Helix* (*Paryphanta*) *crebriflammis*, Pfr.: Hector, Cat. Land Moll. N.Z., 10. *Nanina* (*Paryphanta*) *crebriflammis*, Pfr., Nomencl. Hel. Viv., 35. *Paryphanta crebriflammis*, Pfr.: Hutton, M.N.Z.M., 24. *Amphidoxa crebriflammis*, Pfr.: Hutton, T.N.Z.I., xvi, 199. *Flœa crebriflammis*, Pfr.: Tryon, Man. Conch. (2), i, 130, pl. 26, f. 9. *Flammulina crebriflammis*, Pfr.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 644; Suter, J. de Conch., xli, 239.

Shell small, depressed, umbilicated, thin, finely striated, shining, pellucid, with brown zigzag bands. *Sculpture* formed by close un-

equal and arcuate growth-striæ. *Colour* luteous, with thickly set flame-like markings of reddish-brown, extending to the umbilicus. *Epidermis* thin and polished. *Spire* slightly elevated, rather convex, its height about half that of the aperture. *Protoconch* of 1½ convex whorls, smooth. *Whorls* 3¼ to 3½, somewhat convex, the last not descending, rapidly increasing, subdepressed, more convex at the base, periphery narrowly convex. *Suture* deep. *Aperture* slightly oblique, lunately oval. *Peristome* simple, straight, right margin arcuated in front. *Columella* short, arcuate. *Inner lip* slightly thickened, somewhat reflexed above, and extending as a very thin layer over the convex parietal wall. *Umbilicus* open, about two-fifths of the greatest diameter.

Diameter—Maj., 7 mm. ; min., 5·5 mm. : height, 3 mm.

Dentition (Hutton, T.N.Z.I., xvi. 171, pl. 11, f. G—*Paryphanta crebriflammis*).—Jaw and radula as usual in the genus. The formula of teeth is 11+7+1+7+11.

Type in the British Museum.

Hab.—New Zealand (Strange). North Island : Waikato ; Toko, near Stratford (R. Murdoch) ; Taupo (H. Hill) ; near Waitomo Caves (A. Hamilton) ; Rotorua (Major Broun) ; Waimate Plains (R. Murdoch) ; Mount Egmont. South Island : Kenepuru (McMahon) ; Wairoa Gorge ; Greymouth ; Happy Valley, Canterbury (F. Suter) ; Riccarton Bush (H. S.) ; Akaroa ; Little River.

7. Flammulina Feredayi, Suter, 1891. Plate 9, fig. 10, *a*, *b*.

Amphidoxa (*Calymna*) *Feredayi*, Sut., T.N.Z.I., xxiii, 1890 (1891), 91, pl. 18, f. 10, Q, R. *Gerontia* (*Calymna*) *Feredayi*, Sut. : Pilsbry, Man. Conch. (2), viii, 74, pl. 22, f. 58–60. *Flammulina* (*Calymna*) Feredayi, Sut. : Hedley and Suter, P.L.S. N.S.W. (2), vii, 645 ; Suter, J. de Conch., xli, 242.

Shell very small, globosely depressed, imperforate, shining, pale-horny, costate, thin and translucent. *Sculpture* formed by very fine thread-like arcuate and retractive radial riblets, 10 to 12 per millimetre, getting obsolete on the base ; interstices smooth ; protoconch microscopically spirally striated. *Colour* uniformly pale-horny. *Spire* very short, obtuse, broadly convex. *Protoconch* of 1½ flattish whorls. *Whorls* 3½, rapidly increasing, rounded, periphery convex ; base much impressed in the middle. *Suture* well marked. *Aperture* oblique, rotundly ovate. *Peristome* thin, straight, regularly arched, the upper part advancing. *Columella* vertical, arcuate. *Inner lip* not reflexed. *Umbilical region* infundibuliform.

Diameter, 3·5 mm. ; height, 2 mm.

Animal long, slender, yellowish-grey with fine black spots. Eye-peduncles black, rather stout, slightly clavate ; eyes large. A streak on each side of the head black. Mantle subcentral, whitish. Foot 4 mm. long, with a peripodial line. Tail acutely rounded, with a mucous gland.

Jaw arcuate, tapering, consisting of numerous vertical parallel lamellæ.

Dentition.—Formula of teeth 13 + 7 + 1 + 7 + 13. Central and lateral teeth tricuspid, marginals with 3 cutting-points.

Type in my collection.

Hab.—North Island: Forty-mile Bush, type (H. S.); Hunua Range (Major Broun); Otaki Gorge (Preston). Stewart Island: Half-moon Bay (A. Hamilton).

Subsp. **glacialis**, Suter, 1891.

Amphidoxus (*Calymna*) *Feredayi*, Sut., var. *glacialis*, Sut., T.N.Z.I., xxiii, 1890 (1891), 92. *Flammulina* (*Calymna*) *Feredayi glacialis*, Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 645; Suter, J. de Conch., xli, 242.

Shell very small, globosely depressed, imperforate, silky, fragile, transparent, finely costate. *Sculpture* consisting of very fine distinct and close striæ, arcuate above, straight on the base, about 25 per millimetre. *Spire* almost flat. *Protoconch* smooth, but microscopically spirally striate, of 1½ lightly convex volutions. *Whorls* 3½, rapidly increasing, rounded; base with an infundibuliform depression in the centre. *Suture* impressed. *Aperture* oblique, rotundly ovate. *Peristome* thin, regularly arched, the upper part of the outer lip advancing; margins slightly convergent. *Columellar margin* not reflexed.

Diameter, 3·5 mm.; height, 1·75 mm.

Animal with a caudal mucous gland.

Jaw and *radula* much the same as in the species.

Type in my collection.

Hab.—Hooker Valley (H. S.).

Remarks.—The subspecies differs from the species mainly in the much closer and finer riblets, and the somewhat less-elevated spire.

8. **Flammulina Jacquenetta**, Hutton, 1883. Plate 9, fig. 11, *a*, *b*.

Amphidoxa Jacquenetta, Hutt., N.Z.J.S., i, 1883, 476; T.N.Z.I., xvi, 179, pl. 10, f. C; *l.c.*, 198. *Gerontia* (*Calymna*) *Jacquenetta*, Hutt.: Pilsbry, Man. Conch. (2), viii, 76, pl. 20, f. 70–72. *Flammulina Jacquenetta*, Hutt.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 643; Suter, J. de Conch., xli, 240.

Shell small, perforate, flattened, keeled, thin and fragile. *Sculpture* consisting of delicate growth-striæ, very finely and irregularly diagonally reticulated, and crossed with faint distant spiral striæ. *Colour* pale brown. *Spire* flat or very slightly convex. *Whorls* 2½, rapidly increasing, very slightly convex, the last acutely keeled and rounded on the lower surface. *Suture* impressed. *Aperture* oblique, subrhomboidal, much broader than high. *Peristome* simple, straight.

Outer lip sharply angled : *basal lip* convex. *Columella* oblique, arcuate. *Perforation* narrow.

Diameter—Maj., 5 mm. ; min., 3 mm. : height, 1·5 mm.

Animal unable to withdraw completely into its shell ; the mantle rather broadly reflected over the margin of the shell ; eye-peduncles short and stout, separated at their bases ; orange-yellow, the upper sides thickly marbled with black ; the oculiferous and lower tentacles black.

Jaw nearly straight, thin, striated in the centre, and slightly folded towards the ends.

Radula having the formula 28+ 1+28 ; laterals about 9. Central and inner laterals tricuspid, the outer laterals with the entocone small, the ectocone disappearing ; marginals first bicuspid, then with about 5 cutting-points, of which the two inner are much larger.

Type in the Canterbury Museum. Christchurch.

Hab.—Greymouth (R. Helms).

9. **Flammulina olivacea**, Suter, 1892. Plate 26, fig. 17, *a*, *b*.

Amphidoxa (*Calymna*) *olivacea*, Sut., T.N.Z.I., xxiv, 290, pl. 21, f. 13–15. *Gerontia* (*Calymna*) *olivacea*, Sut. : Pilsbry, Man. Conch. (2), viii, 75, pl. 22, f. 61–63. *Flammulina* (*Calymna*) *olivacea*, Sut. : Hedley and Suter, P.L.S. N.S.W. (2), vii, 645 ; Suter, J. de Conch., xli, 242.

Shell small, globosely depressed, perforated, shining, thin and fragile, costate, pellucid. *Sculpture* consisting of very close-set arcuate radial riblets, about 10 per millimetre, interrupted on the upper surface by several distant but distinct spiral grooves. *Colour* pale yellow-olive, without any colour-markings. *Epidermis* very thin, shining. *Spire* slightly elevated, obtuse, its height about three-quarters that of the aperture. *Protoconch* of 1½ smooth whorls. *Whorls* 3, rapidly increasing, convex, the last slightly flattened above ; base rounded and with a deep infundibuliform depression round the perforation. *Suture* deep. *Aperture* oblique, rotundly ovate, slightly excavated by the parietal wall. *Peristome* very thin, straight, regularly arched, the upper part of the outer lip advancing ; margins approximating. *Columella* subvertical, slightly arcuate. *Inner lip* thin, sharp, not reflexed. *Perforation* very narrow and not deep.

Diameter—Maj., 5 mm. ; min., 4 mm. : height, 3·5 mm. Aperture—Height, 2 mm. ; breadth, 2·5 mm.

Jaw arcuate, with numerous vertical plaits, indenting the upper margin.

Radula with the formula 100 × 17+8+1+8+17. Central tooth tricuspid ; laterals very similar to the central, but with longer cutting-points ; marginals first bicuspid, then with 3 to 4 denticles, which coalesce on some of the outer teeth.

Type in my collection.

Hab.—Hillyer's Creek, Auckland (C. T. Musson). Apparently a rare shell.

10. **Flammulina Perdita**, Hutton, 1883. Plate 9, fig. 12, *a*, *b*.

Amphidoxa Perdita, Hutt., N.Z.J.S., i, 1883, 476; T.N.Z.I., xvi, 179, 198. *Gerontia* (*Calymna*) *Perdita*, Hutt.: Pilsbry, Man. Conch. (2), viii, 76, pl. 22, f. 73–75. *Flammulina Perdita*, Hutt.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 644; Suter, J. de Conch., xli, 241.

Shell small, depressed, perforated, smooth, thin, shining, pellucid. The only *sculpture* consists of irregular oblique and arcuate growth-striæ, with occasional periods of rest; there is no spiral sculpture. *Colour* pale olive-horny. *Epidermis* thin, shining, pellucid. *Spire* very broadly convex, its height not quite three-fourths that of the aperture. *Protoconch* of $1\frac{1}{2}$ smooth and convex whorls. *Whorls* $3\frac{1}{2}$ to 4, rapidly increasing, rounded, periphery narrowly convex; base less rounded. *Suture* deep. *Aperture* oblique, ovately lunate. *Peristome* thin, straight; the *outer lip* in advance of the *basal lip*; margins converging. *Columella* oblique, arcuate. *Inner lip* very little thickened, reflexed above, and partly covering the deep perforation, whose diameter is 0·7 mm.

Diameter—Maj., 5·75 mm.; min., 5 mm.: height, 4·5 mm

Animal and Dentition.—Hutton, T.N.Z.I., xvi, 179, pl. 11, f. C, Q.

Animal with the mantle central, slightly reflected over the peristome of the shell; tail pointed, depressed, with a mucous gland. Colour dark slate-grey, the mantle marbled with black and white; sole dirty-yellowish.

Jaw arcuated, with 30 to 40 delicate rounded plaits.

Radula with the formula 20+1+20; laterals 6 to 7. Central and lateral teeth tricuspid; marginals with 3 cutting-points, coalescing on the outer teeth.

Type in the Canterbury Museum, Christchurch.

Hab.—North Island: Whangarei; Auckland (Gillies); Thames (Adams); Hunua Range (Major Broun); Waikato; Ohaupo; Tirau; Mount Pirongia (Urquhart); Ngaputahi and Ruatahuna, Tuhoeland; Wanganui; Seventy-mile Bush; Wellington. South Island: Kenepuru (McMahon); Wairoa Gorge; Akaroa (F. Suter); Greymouth, type (Helms); Preservation Inlet.

11. **Flammulina phlogophora**, Peiffer, 1850. Plate 26, fig. 18, *a*, *b*.

Helix phlogophora, Pfr., P.Z.S., 1849 (1850), 127; Reeve, Conch. Icon., vii, pl. 130, f. 790; Pfeiffer, M.H. Viv., iii, 34; Conch. Cab. (2), i, pl. 155, f. 1–4. *H.* (*Paryphanta*) *phlogophora*, Pfr.: Hector, Cat. Land Moll. N.Z., 4. *Nanina* (*Paryphanta*) *phlogophora*, Pfr., Nomencl. Hel. Viv., 35. *Paryphanta phlogophora*, Pfr.: Hutton, M.N.Z.M., 22; Tryon, Man. Conch. (2), i, 128, pl. 26, f. 10. *Vitrina zebra*, Le Guillou, Rev. Zool., v, 1842, 136; Pfeiffer, M.H. Viv., ii, 509; Hector, Cat. Land Moll. N.Z., 1. *Helix zebra*, Le Guill., Cat. Pulm. Brit. Mus., 70. *Flammulina zebra*, Le Guill.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 643; Suter, J. de Conch., xli, 238; Pilsbry, Man. Conch. (2), ix, pl. 3, f. 23. *Helix flammigera*, Pfeiffer, P.Z.S., 1852 (1854), 147. *H. multilimbata*, Hombron and Jacquinot, Voy. P.S., v, 1854, 16, pl. 6, f. 5–8.

Shell small, depressed, imperforate or very narrowly subperforate, very thin, shining, pellucid, with brown zigzag bands. *Sculpture* consisting of fine arcuate and retractive growth-lines only. *Colour* yellowish-white, with angular flame-like markings and rufous serrations, closely set together. *Spire* somewhat convex, slightly elevated, its height about two-fifths that of the aperture. *Protoconch* of $1\frac{1}{2}$ smooth convex volutions. *Whorls* 3 to $3\frac{1}{2}$, convex, rapidly increasing, the last not descending, depressed; base flattish, impressed in the middle. *Suture* deep. *Aperture* diagonal, rotundly oval. *Peristome* simple, straight. *Columella* subvertical, arcuate. *Inner lip* thin, reflexed above, and spreading as a thin layer over the convex parietal wall. *Perforation* slightly open or quite sealed up.

Diameter—Maj., 7 mm.; min., 6 mm.: height, 3·5 mm. (type).

Animal and Dentition.—Hutton, T.N.Z.I., xvi, 170, pl. 9, f. Z; pl. 11, f. P (*Paryphanta phlogophora*).

Animal with the mantle subcentral, slightly reflected over the peristome of the shell, the margin entire; eye-peduncles moderate, thick, the tentacles short; tail depressed, rounded, with a mucous gland. Colour slate-grey, the sole and sides of the foot orange.

Jaw arched, thick, tapering towards the ends, with very numerous fine vertical plaits (smooth, according to Hutton).

Dentition.—Radula having the formula 13+8+1+8+13. Central tooth tricuspidate, the side cusps minute; laterals with the ectocone becoming obsolete and the entocone of moderate size; marginal teeth with 3 points, of which the middle is the longest.

Type in the British Museum.

Hab.—North Island: Near Rotorua (Major Broun); Taupo (H. Hill); Mount Pirongia (Urquhart); Toko, near Stratford (R. Murdoch); Forty-mile Bush (H. S.); Wellington. South Island: Kenepuru (McMahon); Birch Hill, Nelson (E. Suter); Stonyhurst (F. Suter); Capleston (Cavell); Greymouth; Oxford (Professor Chilton); Riccarton Bush (H. S.); Akaroa (F. Suter); Preservation Inlet. Auckland Islands (Le Guillou).

Remarks.—The specific name *zebra* has, no doubt, priority; but, as no figure of the shell was given, I select Pfeiffer's *phlogophora* as being the next in chronological order, and which was figured by Reeve. Moreover, I have not seen Le Guillou's species from the Auckland Islands, which is narrowly umbilicated, and may be distinct from *F. phlogophora.*

12. **Flammulina Pilsbryi**, Suter, 1894. Plate 9, fig. 13, *a*, *b*.

Flammulina Pilsbryi, Sut., T.N.Z.I., xxvi, 1893 (1894), 133, pl. 19, f. 32, *a*, *b*.
F. (*Calymna*) *Pilsbryi*, Sut., J. de Conch., xli, 243.

Shell minute, discoidal, umbilicated, thin and semitransparent, closely and finely costate. *Sculpture* on the post-nuclear whorls consisting of fine and close arcuate retractive riblets, about 20 per milli-

metre; the interstices with fine growth-lines, which are reticulated by fine microscopic spiral lines extending over all the whorls. *Colour* horny, with radiate brown streaks, which usually form zigzag lines at the periphery, flowing more or less together. The colour-markings are very variable; sometimes there are only a few broad brown streaks on the upper side. *Spire* flat. *Protoconch* of 1½ spirally striated convex whorls. *Whorls* 4, the last two rapidly increasing, slightly convex, the last not descending, periphery rounded; base convex. *Suture* not deep. *Aperture* slightly oblique, rotundly lunate. *Peristome* acute, straight, margins approximating. *Columella* short, arcuate, not reflexed. *Umbilicus* conical, almost one-third of the greatest diameter.

Diameter—Maj., 2·75 mm.; min., 2·6 mm.: height, 1 mm.

Jaw membranous, arcuate, vertically plaited.

Radula' having the formula $100 \times 7 + 4 + 1 + 4 + 7$. Central and lateral teeth tricuspid; marginals tridentate, the median tooth being the largest.

Type in my collection.

Hab.—North Island: Mount Wellington lava-fields (H. S.); Howick; Rotorua (Major Broun); Ngaputahi, Tuhoe-land (A. Hamilton); Toko, near Stratford (R. Murdoch); Waimarama (A. Hamilton); Seventy-mile Bush; Forty-mile Bush (H. S.). South Island: Nelson; Kenepuru; Happy Valley, Canterbury (F. Suter); Capleston; Riccarton Bush, type (H. S.); Port Hills, Lyttelton (H. S.); Hooker Valley (H. S.).

Genus 11. RANFURLYA, Suter, 1903.

Ranfurlya, Suter, J. Mal., x, June, 1903, 62. Type: *R. Constanceæ*, Suter.

As there is only one species known at present, the diagnosis of the species is also that of the genus.

1. **Ranfurlya Constanceæ**, Suter, 1903. Plate 11, figs. 12. 12*a*. 12*b*.

Ranfurlya Constanceæ, Sut., J. Mal., x, 62, pl. 4, f. 1–5.

Animal limaciform, minute, black all over, with subcentral visceral hump, the greater part of the viscera protected by a shell, which in turn is partly covered by the mantle. Most likely in the living animal the mantle covers the whole of the shell. All the tentacles are retracted in the spirit specimen at my disposal. Neck, sides, and tail rugose, 3 longitudinal grooves on the neck; mantle smooth, minutely punctured. Sole undivided, with slight transverse rugæ, separated from the foot by a double pedal line. Genital orifice behind the right tentacles; pulmonary orifice on the right anterior side of the mantle, ending in a short distal slit; anal orifice on the right side, just below the middle of the visceral hump. Tail rounded, with a mucous pore.

Total length, 6 mm. ; height, 3 mm. ; height of neck, 1·75 mm. Visceral hump—Length, 4·5 mm. ; height, 2 mm. ; breadth, 2·5 mm. Sole—Breadth, 1·5 mm. (spirit specimen).

Shell auriform, yellowish-horny, flexible, membranaceous, transparent, with a notch on the right posterior side ; 1 whorl only, with microscopic distant growth-lines.

Length, 2·75 mm. ; breadth, 1·6 mm.

Jaw arcuate, delicate, composed of 15 very thin vertical laminæ, all of which are separated from one another.

Radula elongated, tongue-shaped, consisting of about 150 straight transverse rows of teeth, the formula being $13+7+1+7+13$. The last marginal tooth is a minute plate with a rudimentary denticle ; in the two following teeth the denticles still coalesce, but show beginning division. The base of attachment in most of the marginals is much broader than high. On the 17th tooth the division into distinct teeth begins ; the ectocone is always smallest, sometimes bidentate, the mesocone is the stoutest, and the entocone is more slender and slightly directed towards the centre of the radula. A few quadrate transition teeth occur between the marginal and lateral teeth, on which the ectocone is minute, the mesocone large, reaching to the posterior margin of the base, and the entocone about twice the size of the ectocone. The laterals have a square base, higher than broad, and are tricuspid. The mesodont reaches a little beyond the posterior margin of the base, the side cusps are short and with minute cutting-points. The central tooth is exactly like the mesial laterals.

Type in my collection.

Hab.—Auckland Islands (Lady Constance Knox). During the Subantarctic Expedition two specimens were found by Professor W. B. Bentham, one at an altitude of 1,350 ft.

Remarks.—Ranfurlya stands in the same relation to *Flammulina* as *Schizoglossa* does to *Paryphanta*.

Note.

Quite a number of foreign shells were sent by Mr. T. W. Kirk to Captain Hutton, stating that they had been found in New Zealand, and giving exact localities. Mr. Kirk made an error, and, as some of them were described as new species, they will have to be expunged from our fauna list. They are as follows :—

1. *Amphidoxa Lavinia*, Hutton, T.N.Z.I., xvi, 180, which is the common Australian *Rhytida capillacea*, Fér.

2. *Vitrina Milligani*, Pfr. (T. W. Kirk, T.N.Z.I., xii, 307). This is certainly not the rare Tasmanian species, but *Paryphanta urnula*, Pfr.

3. *Neritina fluviatilis*, L. (T. W. Kirk, T.N.Z.I., xiv, 268). The specimens are correctly named, but they certainly do not belong to the New Zealand fauna.

4. *Trochomorpha* (?) *Hermia*, Hutton, T.N.Z.I., xvi, 183. This is *Pachystyla inversicolor*, Fér., from Mauritius.

5. *Cyclotus Charmian*, Hutton, T.N.Z.I., xvi. 183, which is *C. Macgillivrayi*, Pfr., from the New Hebrides.

6. *Pyrrha guttula*, Pfr.: Hutton, T.N.Z.I., xvi, 200. It is certainly not Pfeiffer's species, which is a much smaller shell than that which is still in Hutton's collection in the Canterbury Museum; it is a foreign helicoid shell, but it is still undetermined.

Fam. ENDODONTIDÆ, Pilsbry.

Animal having distinct grooves above the margin of the foot, but no caudal mucous pore. Genital system simple, lacking all accessory appendages.

Shell small, varying from discoidal to trochiform, generally umbilicated, surface striate or ribbed.

Distribution.—Polynesia, Australasia, South Africa, St. Helena, Ceylon, Celebes, &c.

Subfam. 1. ENDODONTINÆ.

Jaw thin, membranous, arcuate, vertically striated. Radula having the central and lateral teeth tricuspid, marginals with 3 to 4 cusps.

Genus 1. ENDODONTA, Albers, 1850.

Endodonta, Albers, "Die Heliceen," 1850, 89. Type: *Helix lamellosa*, Fér.
Endodonta, Martens, "Die Heliceen," ed. 2, 90; Pilsbry, Man. Conch. (2), ix, 20.

Animal having a peripodial groove, no caudal mucous pore. Eye-peduncles club-shaped. Reproductive organs simple. Jaw thin, vertically more or less distinctly striated. Radula with the basal plates of central and lateral teeth large and square, tricuspid, the laterals sometimes lacking the entocones; marginal teeth having a low wide basal plate, bearing 3 or 4 cusps, the entocone and mesocone generally united at the base, ectocone simple or bifid.

Shell small, varying from discoidal to trochiform, generally umbilicated; the surface striated or ribbed. Aperture varying from multidentate to toothless; peristome simple.

Distribution.—Polynesia, Australasia, Celebes, South Africa, St. Helena, New Caledonia, Philippine Islands, Carolines.

SYNOPSIS OF SUBGENERA.

1. Aperture having internal teeth or folds upon the outer wall and the parietal wall, sometimes lacking upon the latter — THAUMATODON.
2. Aperture with numerous low folds within the outer lip, columellar lip sometimes with 1 or 2 larger entering lamellæ, and parietal wall bearing 1 or more smaller folds, sometimes emarginate — PTYCHODON.

3. Shell pupiform, cylindrical, aperture toothless .. .. PHENACHAROPA.
4. Shell elevated, dome-shaped, altitude about equal to the diameter, aperture toothless .. .. ÆSCHRODOMUS.
5. Shell depressed, subdiscoidal, periphery convex or subangular, surface rib-striate, openly umbilicated, aperture toothless .. .. CHAROPA.

Subgen. 1. THAUMATODON, Pilsbry, 1893.

Thaumatodon, Pilsbry, Man. Conch. (2), ix, 26. Type: *Endodonta multilamellata*, Garrett. *Pitys*, Pease, P.Z.S., 1871, 450 (in part); Garrett, Journ. Acad. Nat. Sci. Philad., viii, 1881, 388; not *Pitys*, Beck, Ind. Moll., 1837, 9.

Shell discoidal, the spire low, convex; umbilicus open or closed; periphery generally broadly rounded; surface rib-striate, unicoloured or flammulate; aperture having internal teeth or folds upon the outer wall and the parietal wall, sometimes lacking upon the latter.

Distribution.—Polynesia, Philippine Islands, Celebes, New Zealand, New Caledonia, Tasmania.

Remarks.—The genus *Afrodonta*, Melvill and Ponsonby, A.M.N.H. (8), i, 1908, 133, from Natal, seems to be very nearly allied to *Thaumatodon* and *Ptychodon*.

KEY TO SPECIES.

1. Aperture with 1 lamella on the parietal wall, at about the middle; lamella strong .. .. *varicosa.*
2. Aperture with 2 lamellæ on the outer wall .. .. .. *cryptobidens.*
3. Aperture with 1 lamella on the paricta1 and 2 on the outer wall.. *tau.*
4. Aperture with 2 lamellæ on the parietal and 4 on the outer wall *Jessica.*
5. Aperture with 1 lamella on the upper part of the parietal wall; lamella long, slender, low .. .. *monoplax.*

1 **Endodonta cryptobidens**, Suter, 1891. Plate 9, fig. 14, *a*, *b*.

Pitys cryptobidens, Sut., T.N.Z.I., xxiii, 1890 (1891), 89, pl. 17, f. 7, *a–c*, M, N. *Patula* (*Endodonta*) *cryptobidens*, Sut.: Pilsbry, Man. Conch. (2), viii, 85, pl. 24, f. 28–31. *Endodonta cryptobidens*, Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 651. *E.* (*Thaumatodon*) *cryptobidens*, Sut., J. de Conch., xli, 258.

Shell minute, discoidal, umbilicated, greyish, not shining, very fragile, subtransparent, minutely costate. *Sculpture* consisting of very fine and extremely close-set radial riblets, about 40 per millimetre, slightly bent forwards, but almost straight on the upper surface, situated at the periphery, and straight on the base; interstices minutely reticulated; protoconch microscopically strongly spirally striate. *Colour* cinereous. *Spire* flat. *Protoconch* of $1\frac{3}{4}$ convex whorls. *Whorls* $4\frac{1}{2}$, narrow, convex, regularly increasing, the last not descending. *Suture* deep. *Aperture* rotundly lunate, subvertical, slightly excavated by the penultimate whorl. *Peristome* simple, acute, somewhat flattened at the base, the upper margin advancing; interior with 2 teeth, one on the basal margin, rising from a small callosity, the second near the middle of the outer wall; both teeth are some

distance from the margin. *Columella* short, arcuate. *Inner lip* slightly reflected. *Umbilicus* broad, perspective, showing all the whorls, about one-third of the greatest diameter.

Diameter, 1·75 mm. ; height, 0·75 mm.

Jaw wide and low, tapering at both ends, cutting-edge lightly concave in the middle, distinctly vertically striate at the centre.

Radula with the central and lateral teeth tricuspid ; inner marginals with 3, outer with 2 cutting-points.

Type in my collection.

Hab.—White Horse Hill, Hooker Valley, amongst mould in the subalpine bush (H. S.). Very rare.

2. **Endodonta Jessica,** Hutton, 1883. Plate 9, fig. 15, *a–c*.

Patula Jessica, Hutt., N.Z.J.S., i, 1883, 475 ; T.N.Z.I., xvi, 174, 192. *P.* (*Endodonta*) *Jessica,* Hutt. : Pilsbry, Man. Conch. (2), viii, 85, pl. 24, f. 24–27. *Endodonta Jessica,* Hutt. : Hedley and Suter, P.L.S. N.S.W. (2), vii, 651 ; Suter, T.N.Z.I., xxvi, 128, pl. 15, f. 14. *E.* (*Thaumatodon*) *Jessica,* Hutt. : Suter, J. de Conch., xli, 258.

Shell small, umbilicated, discoidal, ribbed, aperture with 6 lamellæ. *Sculpture* consisting of numerous rather close radial riblets, 12 to 15 per millimetre ; they are inequidistant, sinuated on the upper surface, but straight and feebler below ; interspaces strongly striated with growth-lines, and microscopically finely, sometimes very indistinctly, reticulated with spirals ; protoconch smooth. *Colour* horny, largely radiately streaked and clouded with reddish-brown, giving a general dark colour to the shell. *Spire* flat, the centre usually sunken, the penultimate whorl mostly raised above the other whorls. *Protoconch* of $1\frac{1}{2}$ convex volutions. *Whorls* $4\frac{1}{2}$ to $5\frac{1}{2}$, very slowly increasing, rounded, periphery and base convex. *Suture* impressed. *Aperture* subvertical, rotundly lunar, within with 6 thin highly arched lamellæ, 2 on the parietal wall, 4 on the outer wall, the lowest close to the columellar lip. *Peristome* thin, flatly angled above, then regularly arched. *Columella* very short, arcuate, its lip not reflexed. *Umbilicus,* wide, perspective, showing all the whorls, nearly half of the greatest diameter.

Diameter—Maj., 4·25 mm. ; min., 3·75 mm. : height, 2 mm.

Animal unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—South Island : Kenepuru (McMahon) ; Nelson ; Bealey, type (Dr. Haast).

3. **Endodonta monoplax,** n. sp. Plate 27, fig. 1, *a*, *b*.

Shell minute, subdiscoidal, umbilicated, light fulvous, thin and fragile, radially closely ribbed, with 1 slender lamella on the upper part of the parietal wall. *Sculpture* consisting of close fine and sharp equidistant flexuous radial riblets, about 12 per millimetre ; the interstices with fine microscopic growth-lines, reticulated by dense

spiral liræ ; the protoconch smooth. *Colour* uniformly light fulvous, the pullus whitish. *Epidermis* thin, not shining. *Spire* very little raised, broadly convex. *Protoconch* of 1½ lightly convex whorls, flattish. *Whorls* 5½, regularly increasing, convex, periphery rounded ; base flatly convex. *Suture* well impressed. *Aperture* oblique, lunate. *Peristome* thin and sharp, the margins distant. *Outer lip* broadly convex, the *basal lip* narrowly rounded. *Columella* very short, arcuate ; the parietal wall convex, with a very low long and slender lamella on its upper part, not much below the suture. *Umbilicus* rather wide, deep, narrowly perspective, its diameter nearly one-third of the greatest diameter of the shell.

Diameter—Maj., 2·6 mm. ; min., 2·3 mm. : height, 1·4 mm.

Type in my collection.

Hab.—Bisbee Bay, Preservation Inlet. Collected by the scientific party which visited the Sounds in December, 1908.

4. Endodonta tau, Pfeiffer, 1862. Plate 27, fig. 2, *a*, *b*.

Helix tau, Pfr., Mal. Bl., viii, 1862, 148 ; M.H. Viv., v, 159 ; Hector, Cat. Land Moll. N.Z., 12. *Patula* (*Charopa*) *tau*, Pfr., Nomencl. Hel. Viv., 98 ; Hutton, M.N.Z.M., 8. *Endodonta* (*Thaumatodon*) *tau*, Pfr. : Murdoch, P. Mal. S., iii, 321. *Patula Timandra*, Hutton, N.Z.J.S., i, 1883, 475 ; T.N.Z.I., xvi, 175, 192. *Endodonta Timandra*, Hutt. : Suter, T.N.Z.I., xxvi, 128, pl. 15, f. 13 ; P.L.S. N.S.W. (2), viii, 492. *Patula* (*Endodonta*) *Timandra*, Hutt. : Pilsbry, Man. Conch. (2), viii, 84, pl. 24, f. 21–23. *Endodonta varicosa*, Pfeiffer : Hedley and Suter, P.L.S. N.S.W. (2), vii, 651 ; not of Pfeiffer. *Endodonta* (*Thaumatodon*) *Timandra*, Hutt. : Suter, J. de Conch., xli, 258. *Thaumatodon mira*, Webster, T.N.Z.I., xl, 257, pl. 21, f. 23.

Shell small, discoidal, umbilicated, distantly ribbed. *Sculpture* consisting of radial sharp riblets on the post-nuclear whorls, inequidistant, situated on the upper surface and near the periphery, straight on the base, 3 to 4 per millimetre ; the interstices with minute and numerous fine growth-lines, reticulated by very fine and dense microscopic spiral striæ, visible also on the protoconch. *Colour* brown, tessellated with whitish. *Spire* flat, usually depressed at the centre and the penultimate whorl raised, especially above the last whorl. *Protoconch* small, of 1½ convex turns. *Whorls* 5, rather convex, slowly increasing, periphery and base convex. *Suture* impressed. *Aperture* small, slightly oblique, rotundly lunar, within with 3 lamellæ —1 at the middle of the parietal wall, 1 opposite on the outer wall, the two sometimes closely approaching, and 1 at the base of the inner lip ; they are thin and high, rather long, and broadly arched. *Peristome* simple, straight, margins converging. *Columella* very short, arcuate. *Lip* not reflexed. *Umbilicus* very broad, perspective, gradated, about one-third of the greatest diameter.

Diameter—Maj., 3 mm. ; min., 2·75 mm. : height, 1 mm. (type). Diameter—Maj., 4·1 mm. ; min., 3·6 mm. : height, 2·1 mm. (very large specimen).

Animal unknown.

Type in Pommersches Museum, Stettin.

Hab.—North Island: Whangarei (Musson); Auckland and Mount Wellington lava-fields; Wade; Thames; Hunua Range (Major Broun); Ohaupo (Musson); Waiuku (Webster); Mount Pirongia; Kaiti, Gisborne (A. Hamilton); Mount Egmont, 3,000 ft. to 4,500 ft. (R. Murdoch); Forty-mile Bush (H. S.); Kaponga; Eltham; Horokiwi. South Island: Kenepuru (McMahon); Happy Valley, Stonyhurst (F. Suter).

Remarks.—Webster says that the lamella on the parietal wall in *T. mira* is bifid. This is an optical illusion, as in nearly all specimens of *E. tau* I have examined this highly raised arched lamella appears to be bifid, the effect being produced by an oblique white line in the lamella. When the outer wall is removed it will be seen, however, that the lamella is simple. I fail to see anything in Webster's diagnosis and figure which would justify the separation of *T. mira* from *E. tau*. The lamella on the outer wall is not always present, but indicated always by a callous patch.

5. Endodonta varicosa, Pfeiffer, 1853. Plate 27, fig. 3, *a*, *b*.

Helix varicosa, Pfr., M.H. Viv., iii, 1853, 97; P.Z.S., 1852 (1854), 148; Reeve, Conch. Icon., vii, pl. 133, f. 824; Tryon, Struct. Syst. Conch., iii, pl. 3, f. 10; Hector, Cat. Land Shells, N.Z., 11. *Patula* (*Charopa*) *varicosa*, Pfr., Nomencl. Hel. Viv., 97. *P. varicosa*, Pfr.: Hutton, M.N.Z.M., 7; T.N.Z.I., xvi, 192; Tryon, Man. Conch. (2), iii, 23, pl. 3, f. 10. *Endodonta varicosa*, Pfr.: Suter, T.N.Z.I., xxvi, 128, pl. 15, f. 12; Hedley and Suter, P.L.S. N.S.W. (2), vii, 651. *E.* (*Thaumatodon*) *varicosa*, Pfr.: Suter, J. de Conch., xli, 257.

Shell small, discoidal, umbilicated, distantly radially costate, not shining. *Sculpture* on the post-nuclear whorls consisting of radiate distant riblets, 3 to 4 per millimetre, in front of the aperture, usually much more distant on the last half of the body-whorl; they are strongly sinuated on the upper surface, almost straight below; interstices with minute crowded growth-striæ, crossed by indistinct close microscopic spiral lines. *Colour* brown, irregularly mottled with whitish. *Spire* flattish, depressed in the centre, the penultimate whorl slightly raised. *Protoconch* very small, of $1\frac{1}{2}$ convex whorls. *Whorls* $4\frac{1}{2}$ to 5, slowly increasing, convex, periphery and base rounded. *Suture* deep. *Aperture* small, oblique, lunar, within with a thin high lamella on the middle of the parietal wall. *Peristome* simple, straight. *Columella* short and arcuate, the lip slightly reflexed above. *Umbilicus* wide, perspective, about one-third of the greatest diameter.

Diameter—Maj., 3·5 mm.; min., 3·25 mm.: height, 2 mm. (type).

Dentition (Suter, P.L.S. N.S.W. (2), viii, 493, pl. 22, f. 7).—Radula having the formula 13 to 15 + 1 + 15 to 13; laterals 3, and transition teeth the same number. Central and lateral teeth tricuspid; marginals with 3 or 4 cutting-points.

Type in the British Museum.

Hab.—North Island : Near North Cape ; Whangaroa (C. Cooper) ; Wade ; Waitakerei Range (H. S.) ; Waikato ; Toko, near Stratford (R. Murdoch) ; Ngaputahi, Tuhoe-land (A. Hamilton). South Island : Riccarton Bush and Dyer's Pass (H. S.) ; Akaroa (F. Suter).

Subsp. Iredalia, Webster, 1908,

Thaumatodon Iredalia, T.N.Z.I., xl, 1907 (1908), 256, pl. 21, f. 19–22.

Whorls 4, last descending. *Colour* horny, irregularly blotched with dark brown. *Protoconch* $1\frac{1}{4}$ whorls, striated. *Sculpture :* Body-whorl with growth-lines, spiral striations, and 13 strong ribs, which slope backwards from the suture, and extend, sloping forwards, into the umbilicus, which is pervious, and occupies one-fourth of the major diameter. *Aperture* advancing slightly above. The body has 1 simple lamella within the aperture ; it is hardly visible until the shell is revolved so as to see well into the opening. (Webster.)

Diameter—Maj., 3·25 mm. ; min., 3 mm. : height, 1·5 mm.

Type in the Canterbury Museum, Christchurch.

Hab.—Ashley Gorge, Canterbury (T. Iredale).

Remarks.—The shell is a little more depressed and the whorls more rapidly increasing than in the species. The chief characteristic point is the small number of radiate riblets, which are reduced to about half the number usually met with in *E. varicosa*. The umbilicus is also slightly narrower.

Subgen. 2. Ptychodon, Ancey, 1888.

Ptychodon, Ancey, Bull. Soc. Mal. France, v, March, 1888, 372. Type : *Strobila leiodus*, Hutton. *Strobila*, Hutton, 1883 ; not of Morse, 1864. *Huttonella*, Suter, 1890 ; not of Pfeiffer, 1855. *Maoriana*, Suter, 1891.

Animal with peripodial groove, without caudal mucous pore.

Jaw membranaceous, slightly arcuate, with distant vertical striæ.

Radula consisting of 90–100 slightly sinuous transverse rows of teeth, the formula varying from 6+4+1+4+6 to 10+7+1+7+10. Central tooth tricuspid. Lateral teeth similar, tricuspid. Marginal teeth tricuspid or quadricuspid, the cusps showing a tendency to coalesce on the outer ones.

Shell discoidal, with low convex spire, umbilicated, rounded periphery, and rib-striated surface ; aperture crescentic, subvertical ; outer lip thin, simple, armed a short distance within with numerous low folds ; columellar lip bearing 1 or 2 larger entering lamellæ, and parietal wall bearing 1 or 2 stout entering plates, sometimes emarginate, or several smaller folds.

Distribution.—New Zealand ; Campbell Island.

The species live under bark and rotten wood, in the bush.

KEY TO SPECIES.

A. Riblets about 12 per millimetre; parietal wall with 7 lamellæ *leiodon.*
B. Riblets about 15 per millimetre.
  a. Narrowly perforated.
    b. Parietal wall with 2 lamellæ, the lower one stout .. *ureweraensis.*
    bb. Parietal wall with 3 equal lamellæ .. .. *pseudoleiodon.*
  aa. Umbilicus one-fourth of greatest diameter: parietal wall with 1 emarginate lamella .. .. .. *aorangi.*
  aaa. Umbilicus one-third of greatest diameter.
    b. Parietal wall with 5 lamellæ, the uppermost stronger, emarginate .. .. *Hectori.*
    bb. Parietal wall with 3 lamellæ, the uppermost stronger, emarginate .. .. *hunuaensis.*
    bbb. Parietal wall with 5 simple lamellæ, the four lower ones close together .. .. *wairarapa.*
C. Riblets about 25 per millimetre; umbilicus one-third of greatest diameter.
  a. Parietal wall with 1 simple lamella .. .. .. *Chiltoni.*
  aa. Parietal wall with 1 emarginate lamella .. .. *microundulata*
D. Riblets about 30 per millimetre; outer wall with 8 lamellæ .. *minuta.*

1. Endodonta aorangi, Suter, 1890. Plate 27, fig. 4. *a. b.*

Helix aorangi, Sut., T.N.Z.I., xxii, 1889 (1890), 223, pl. 14, f. 5, *a–c.* *Patula* (*Maoriana*) *aorangi*, Sut.: Pilsbry, Man. Conch. (2), viii, 90, pl. 24, f. 48–51; ix, pl. 4, f. 30–32. *Endodonta* (*Ptychodon*) *aorangi*, Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 653; Suter, J. de Conch., xli, 260.

Shell minute, depressed, umbilicate, finely costate, thin, not shining. *Sculpture* consisting of radiate nearly straight riblets, about 15 per millimetre, closer together on the protoconch; interstices with minute and numerous lines of growth. *Colour* yellowish-white, with somewhat irregular chestnut zigzag or sinuated streaks. *Spire* but little elevated, broadly convex. *Protoconch* of 1½ convex volutions. *Whorls* 5 to 5½, slowly increasing, rounded; periphery and base convex. *Suture* impressed. *Aperture* slightly oblique, rotundly lunar, within with 12 laminæ—1 on the parietal wall a little above the middle, fairly stout, emarginated above by a deep groove; 2 stout tongue-shaped laminæ, connected at the base, on the columellar lip, the upper shorter and sharp, the lower high and blunt; 9 thin and slender long lamellæ on the outer wall, the four upper ones separated from the lower by a somewhat larger interspace. *Peristome* straight, acute, margins slightly convergent. *Columella* very short, oblique, arcuate, lip not reflexed above. *Umbilicus* deep, perspective, about one-fourth of the greatest diameter.

Diameter, 2 mm.; height, 1·25 mm.

Dentition.—Suter, T.N.Z.I., xxiv, 300, pl. 23, f. 51, 52.

Jaw arcuate, narrow, slightly tapering at the ends, with about 10 distant vertical striæ.

Radula having the formula $90 \times 10+7+1+7+10$. Central and lateral teeth tricuspid: marginals tricuspid, the outer ones with 2 cusps only.

Type in my collection.

Hab.—White Horse Hill, Hooker Valley, type (H. S.); Nelson.

2. Endodonta Chiltoni, Suter, 1909. Plate 27, fig. 5.

Endodonta (*Ptychodon*) *Chiltoni*, Sut., P. Mal. S., viii, 1909, 260, pl. 11, f. 21.

Shell minute, subdiscoidal, umbilicated, very finely radially ribbed, thin and fragile, not shining. *Sculpture* of the post-nuclear whorls consisting of very fine, close, nearly straight radial riblets, about 25 per millimetre; the interstices with minute growth-lines. *Colour* yellowish-white, radially streaked with rufous. *Spire* very low, broadly convex. *Protoconch* of $1\frac{3}{4}$ smooth and convex volutions. *Whorls* 5, very slowly increasing, flatly convex; periphery and base rounded. *Suture* deep. *Aperture* slightly oblique, rotundly lunar, within with 11 slender elongated and low lamellæ—1 on the parietal wall above the middle, 1 on the columellar lip, and 9 on the outer wall. *Peristome* thin, sharp, straight, regularly arched. *Columella* very short, arcuate. *Umbilicus* wide, deep, perspective, about one-third of the greatest diameter.

Diameter—Maj., 1·6 mm.; min., 1·4 mm.: height, 0·9 mm.

Animal unknown.

Type in my collection.

Hab.—Kowai Bush, Canterbury, type (Professor Chilton).

3. Endodonta Hectori, Suter, 1890. Plate 27, fig. 6, *a–c*.

Helix Hectori, Sut., T.N.Z.I., xxii, 222, pl. 14, f. 3, *a–c*. *Patula* (*Maoriana*) *Hectori*, Sut.: Pilsbry, Man. Conch. (2), viii, 89, pl. 24, f. 44–47. *Endodonta* (*Ptychodon*) *Hectori*, Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 652: Suter, J. de Conch., xli, 260. *Ptychodon Magdalenæ*, Ancey, "British Naturalist," April, 1891, 65.

Shell minute, discoidal, umbilicated, radially ribbed, thin and fragile, semitransparent, not shining. *Sculpture* consisting of close and fine nearly straight radial riblets, about 15 per millimetre; protoconch finer and closer radially striate; interstices with minute growth-lines; a powerful lens shows traces of fine spiral striation. *Colour* light horny-brown with large close darker-brown streaks. *Spire* nearly flat. *Protoconch* of $1\frac{1}{4}$ convex whorls. *Whorls* 5, slowly and regularly increasing, convex; periphery and base rounded. *Suture* impressed. *Aperture* slightly oblique, rotundly lunar, with 14 laminæ within—5 laminæ on the parietal wall, a stout emarginate lamella at the middle, and four slender and low lamellæ below it, close together; 2 on the columellar lip which are well developed, the upper lamella has two or three sharp points, the lower is narrower, elevated, and sharply pointed; 7 laminæ on the outer wall are rather stout, elevated, not very long, and equidistant. *Peristome* acute, straight, margins convergent. *Columella* very short and oblique. *Umbilicus* wide, deep, perspective, nearly one-third of the greatest diameter.

Diameter, 2·25 mm. ; height, 1–1·2 mm.

Dentition.—Suter, T.N.Z.I., xxiv, 299, pl. 23. f. 46. 47.

Jaw typical, with a few distant vertical striæ.

Radula having the formula $100 \times 10+6+1+6+10$; the teeth normal.

Type in my collection.

Hab.—North Island : Whangarei ; Mount Wellington lava-fields ; Ohaupo (Musson) ; Taranaki ; Forty-mile Bush, type (H. S.). South Island : Kenepuru (McMahon).

4. Endodonta hunuaensis, Suter, 1894. Plate 27, fig. 7. *a*, *b*.

Ptychodon hunuaensis, Sut., P.L.S. N.S.W. (2), viii, 1894, 494, pl. 23, f. 8 (erroneously "*hunnaensis*").

Shell minute, subdiscoidal, umbilicated, not shining, thin and fragile, semitransparent. *Sculpture* consisting of radiate fine nearly straight riblets, about 15 per millimetre, much closer and finer on the protoconch ; they are slightly directed forward ; the interstices with numerous minute growth-lines. *Colour* pale-horny, with distant irregular broad streaks of rufous. *Spire* short, flat. *Protoconch* of $1\frac{1}{2}$ convex volutions. *Whorls* 5, narrow, regularly increasing, slightly rounded, the last descending considerably below the level of the penultimate whorl ; periphery and base convex. *Suture* impressed. *Aperture* oblique, rotundly lunar, having within 12 laminæ—a stout emarginate lamella at the middle of the parietal wall, and 2 more slender simple and equally spaced lamellæ below it ; from the columellar lip 2 large blunt teeth, on a common base, extend rather far into the aperture ; outer wall with 7 somewhat irregular and rather blunt teeth. *Peristome* straight, acute, regularly arched, margins convergent. *Columella* short, oblique, the lip not reflexed. *Umbilicus* wide, perspective, occupying nearly one-third of the greatest diameter.

Diameter, 2 mm. ; height, 1 mm.

Animal unknown.

Type in my collection.

Hab.—North Island : Auckland (H. S.) ; Wade ; Hunua Range, type (Major Broun) ; Mount Taupiri (Urquhart) ; Waimarama (A. Hamilton) ; Dannevirke ; Seventy-mile Bush ; Rusthall, Wanganui (R. Murdoch). South Island : Kenepuru (McMahon).

5. Endodonta leiodon, Hutton, 1883 (em.). Plate 9, fig. 16. *a c*.

Strobila leiodus, Hutt., T.N.Z.I., xv, 1882 (1883), 135. *S. leioda*, Hutt., T.N.Z.I., xvi, 195. *Patula* (*Maoriana*) *leioda*, Hutt. : Pilsbry, Man. Conch. (2), viii, 87, pl. 24, f. 32–35. *Endodonta* (*Ptychodon*) *leioda*, Hutt. : Hedley and Suter, P.L.S. N.S.W. (2), vii, 652 : Suter, J. de Conch., xli, 259.

Shell minute, depressed globose, umbilicated, ribbed, thin, not shining. *Sculpture* consisting of numerous oblique narrow radiate

riblets, flexuous at the periphery, about 12 per millimetre; the interstices with minute fine growth-striæ. *Colour* horny, with radial bands of pale rufous. *Spire* but little elevated, convex. *Protoconch* of 1½ whorls, smooth and convex. *Whorls* 5, very slowly increasing, rounded; periphery and base convex. *Suture* deep, canaliculate. *Aperture* vertical, narrow, lunate, within with 18 lamellæ — 7 spiral plaits on the parietal wall, 1 on the columellar lip, and 10 spiral lamellæ on the outer wall. *Peristome* simple, thin, the outer lip advancing towards the middle, leaving a shallow sinus at the suture. *Columella* short, rather straight, its lip slightly reflexed above. *Umbilicus* rather narrow, about one-sixth of the greatest diameter, nearly cylindrical, margined with brown.

Diameter—Maj., 2 mm.; min., 1·75 mm.: height, 1·25 mm. (type).

Animal having the body elongated, narrow; eye-peduncles long and thick, tentacles moderate; mantle subcentral, rather anterior, enclosed; foot very long and narrow, with neither locomotive disc nor caudal gland. Colour pale grey; eye-peduncles and a stripe on each side of the head purplish; foot pale brown.

Dentition (Hutton, T.N.Z.I., xvi, 166, pl. 9. f. P).—Radula having the formula 12+1+12.

Type in the Canterbury Museum, Christchurch.

Hab.—South Island: Greymouth (Helms).

6. Endodonta microundulata, Suter, 1890. Plate 27. fig. 8. *a c.*

Helix microundulata, Sut., T.N.Z.I., xxii, 1889 (1890), 223, pl. 14, f. 4, *a–d*. *Patula* (*Maoriana*) *microundulata*, Sut.: Pilsbry, Man. Conch. (2), viii, 89. pl. 24, f. 52–56. *Endodonta* (*Ptychodon*) *microundulata*, Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 652; Suter, J. de Conch., xli, 260.

Shell minute, depressed, umbilicate, finely and closely radially rib-striate, faintly shining, thin and fragile. *Sculpture* consisting of very fine, dense, slightly protractive riblets, 25 to 35 per millimetre; the protoconch with still finer and closer costæ; interstices with microscopic very fine growth-lines, crossed by indistinct crowded spiral lines. *Colour* pale-horny with brown undulating or zigzagging radiate bands of variable width. *Spire* very little elevated, flatly convex. *Protoconch* of 1½ convex turns. *Whorls* 5, slowly increasing, rounded; periphery and base convex. *Suture* impressed. *Aperture* slightly oblique, rotundly lunar, within with 13 lamellæ—1 on the middle of the parietal wall, high, thin, distinctly emarginate at the top; 2 on the columellar lip, stout, with large base, both tongue-shaped and nearly of the same size; 10 fine long equidistant lamellæ on the outer wall. *Peristome* straight, acute, the outer lip somewhat advancing at the middle. *Columella* very short, arcuate. *Umbilicus* deep, cylindrical, rather wide, about one-third of the greatest diameter.

Diameter, 1·75 mm.; height, 1 mm. (type).

Dentition.—Suter, T.N.Z.I., xxiv, 299, pl. 23, f. 49, 50; Pilsbry, Man. Conch. (2), ix, pl. 8, f. 5, 6.

Jaw membranous, vertically distantly striated.

Radula with the formula 10 + 4 + 1 + 4 + 10. The central and first lateral teeth are relatively large, otherwise the teeth are normal.

Type in my collection.

Hab.—North Island: Forty-mile Bush, type (H. S.); Waimarama. South Island: Kenepuru (McMahon); Greymouth.

7. Endodonta minuta, Suter, 1909. Plate 27, fig. 9.

Endodonta (*Ptychodon*) *minuta*, Suter, Subantarct. Islds. N.Zeal., i, 1909, 38, pl. 1, f. 15.

Shell minute, discoidal, thin and fragile, radially costate, umbilicated. *Sculpture* consisting of fine sharp equidistant and flexuous thread-like riblets, about 30 per millimetre; the interstices with fine growth-lines; there is no spiral sculpture. *Colour* yellowish-white, with distant narrow radial brown streaks, not extending below the periphery on the last whorl. *Epidermis* thin, slightly shining. *Spire* flat, not elevated above the last whorl. *Protoconch* flat, rather large, of 1½ smooth and lightly convex whorls. *Whorls* 3½, regularly increasing, moderately convex, the last rounded at the periphery and base. *Suture* impressed. *Aperture* lunar, oblique, much excavated by the parietal wall; the outer wall with 8 long thin spiral lamellæ, the lowest two closer together, and the three uppermost inconspicuous; no lamellæ on the parietal wall and columellar lip. *Peristome* simple, thin, sharp, regularly rounded. *Columella* short, vertical, arcuate, very little reflexed. *Umbilicus* wide, perspective, about one-third of the greatest diameter.

Diameter, 1·4 mm.; height, 0·7 mm.

Animal unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—Campbell Island; one specimen (W. K. Chambers).

Remarks.—The specimen is not adult, and it is possible that lamellæ on the parietal wall and columellar lip appear only at a later stage of growth. The numerous slender lamellæ on the outer wall induce me to class it for the present under *Ptychodon*.

8. Endodonta pseudoleiodon, Suter, 1890 (em.). Plate 27, fig. 10, *a–c*.

Helix pseudoleioda, Sut., T.N.Z.I., xxii, 1889 (1890), 221, pl. 14, f. 1, *a–c*. *Patula* (*Maoriana*) *pseudoleioda*, Sut.: Pilsbry, Man. Conch. (2), viii, 88, pl. 24, f. 40–43. *Endodonta* (*Ptychodon*) *pseudoleioda*, Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 652; Suter, J. de Conch., xli, 259.

Shell minute, depressed globose, radially ribbed, perforate, thin, faintly shining. *Sculpture* consisting of close fine sinuous radial riblets, about 15 per millimetre, finer and closer together on the protoconch; interstices with microscopic growth-lines and crowded spiral

striæ. *Colour* yellowish-white, banded with brown streaks, directed backwards. *Spire* slightly raised, convex. *Protoconch* of $1\frac{1}{2}$ convex volutions. *Whorls* 6, convex, very slowly increasing; periphery and base rounded. *Suture* well impressed. *Aperture* rotundly lunar, slightly oblique, within with 12 lamellæ—3 on the parietal wall, the lowest stronger than the others; 1 on the columellar lip, large, tongue-shaped; 8 fine long and slender lamellæ on the outer wall, the lower four somewhat closer together. *Peristome* straight, acute. *Columella* very short, oblique. *Perforation* narrow, deep, open.

Diameter, 2·25 mm.; height, 1·5 mm. (type).

Dentition.—Suter, T.N.Z.I., xxiv. 298, pl. 23, f. 43, 44.

Jaw vertically faintly striated.

Radula having the formula $90 \times 11 + 4 + 1 + 4 + 11$; normal.

Type in my collection.

Hab.—North Island: Whangarei; Wade; Thames; Auckland: Waiheke Island; Waitakerei Range; Tuakau; Hunua Range; Rotorua; Mount Egmont, 3,000 ft. to 4,500 ft. (R. Murdoch); Wanganui; Mount Pirongia; Seventy-mile Bush; Forty-mile Bush, type (H. S.); Taupo; Kaiti, Gisborne; Ohaupo; Heretaunga; Waimarama; Toko, near Stratford. South Island: Kenepuru.

9. Endodonta ureweraensis, Suter, 1899. Plate 27, fig. 11, *a*, *b*.

Endodonta (*Ptychodon*) *ureweraensis*, Suter, J. Mal., vii, Oct. 1899, 53, pl. 3, f. 7–10.

Shell minute, depressed globose, perforated, closely ribbed. *Sculpture* consisting of fine and close flexuous radial riblets, about 15 per millimetre, finer and closer on the protoconch; interstices with minute growth-lines, reticulated by microscopic spiral striæ extending over all whorls. *Colour* yellowish-white, irregularly and zigzag banded with rufous. *Spire* not high, conoidal. *Protoconch* of $1\frac{1}{2}$ convex turns. *Whorls* $5\frac{1}{2}$, flatly rounded, periphery regularly convex, base flattish, impressed in the middle; the volutions first slowly then a little more rapidly increasing. *Suture* impressed. *Aperture* subvertical, lunar, within with 11 laminæ—2 on the parietal wall, the lower high, rather stout and long, situated a little below the middle, the upper lamella half-way between the lower lamella and the upper margin, far back in the mouth in adult specimens, thread-like; 1 lamella on the columellar lip, forming a long sharply pointed tooth; on the outer wall there are 8 long narrow subequidistant thread-like folds. *Peristome* straight, acute, margins distant. *Columella* short, oblique; the lip not reflexed above. *Perforation* minute, open.

Diameter, 2·8 mm.; height, 1·5 mm.

Animal unknown.

Type in my collection.

Hab.—Ngaputahi, Urewera country (A. Hamilton).

10. Endodonta wairarapa, Suter, 1890. Plate 27, fig. 12, *a–c*.

Helix wairarapa, Suter, T.N.Z.I., xxii, 1889 (1890), 222, pl. 14, f. 2, *a–c*. *Patula* (*Maoriana*) *wairarapa*, Sut.: Pilsbry, Man. Conch. (2) viii, 88, pl. 24, f. 36–39. *Endodonta* (*Ptychodon*) *wairarapa*, Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 652; Suter, J. de Conch., xli, 259.

Shell minute, suborbicular, umbilicate, thin and fragile, faintly shining, radially ribbed. *Sculpture* of the post-nuclear whorls consisting of fine close and flexuous riblets, about 15 per millimetre, the interstices with minute growth-lines. *Colour* light horny-brown with brown radial streaks of unequal width. *Spire* but little elevated, flattish. *Protoconch* of $1\frac{3}{4}$ whorls, which are convex and smooth. *Whorls* 6, slowly increasing, narrow, convex, periphery and base rounded. *Suture* well impressed. *Aperture* slightly oblique, roundly lunate, with 16 laminæ within—5 on the parietal wall, the four lower ones close together, the upper one at some distance from the others, all of the same form, thread-like; 1 conical tooth on the columellar lip, a little higher than the other lamellæ; 10 long fine equidistant lamellæ on the outer wall. *Peristome* straight, acute, regularly arched. *Columella* short, oblique, arcuate; lip not reflexed above. *Umbilicus* wide, deep, perspective, about one-third of the greatest diameter.

Diameter, 1·75 mm.; height, 1 mm. (type).

Dentition (Suter, T.N.Z.I., xxiv, 298, pl. 23, f. 45).—Radula having the formula $100 \times 6+4+1+4+6$; teeth normal.

Type in my collection.

Hab.—North Island: Forty-mile Bush, type (H. S.); Waimarama (A. Hamilton). South Island: Kenepuru (McMahon); Happy Valley, Stonyhurst (F. Suter).

Subgen. 3. PHENACHAROPA, Pilsbry, 1893.

Phenacharopa, Pilsbry, Man. Conch. (2), ix, 29. Type: *Pupa novoscelandica*, Pfr. *Pupa* of authors; not of Bolten, nor of Draparnaud. *Tesseraria*, Böttger, 1881; not of Häckel, 1880.

Animal having long eye-peduncles and short tentacles; foot with a peripodial groove, and there is no mucous caudal pore present.

Jaw arcuate, vertically striated.

Radula with tricuspid central and lateral teeth, marginals tri- and quadri-cuspid.

Shell pupiform, cylindrical, the height about double the diameter; apex obtusely rounded; base slightly wider, convex, and narrowly perforated; surface ribbed and maculated as in the subgenus *Charopa*; aperture subvertical, higher than wide, toothless; peristome simple, thin, the columellar margin dilated.

Distribution.—New Zealand.

1. **Endodonta novoseelandica**, Pfeiffer, 1853. Plate 27, fig. 13.

Pupa novoseelandica, Pfr., M.H. Viv., iii, 1853, 530; P.Z.S., 1852 (1854), 149; Reeve, Conch. Icon., xx, pl. 14, f. 126; Küster, Conch. Cab. (2), i. pt. 15, 135, pl. 17, f. 18, 19; Hector, Cat. Land Moll. N.Z., 22. *P. neozelanica*, Pfr.: Hutton, T.N.Z.I., xvi, 191; M.N.Z.M., 22. *Tesseraria novoseelandica*, Pfr.: Suter, T.N.Z.I., xxvi, 129, pl. 16, f. 17; Hedley and Suter, P.L.S. N.S.W. (2), vii, 660. *Endodonta* (*Phenacharopa*) *novoseelandica*, Pfr.: Pilsbry, Man. Conch. (2), ix, 29, pl. 6, f. 60; pl. 8, f. 1, 2: Suter, J. de Conch., xli, 272. pl. 9, f. 3, *a. b.*

Shell subcylindrical, perforated, thin, not shining, costate. *Sculpture* of the post-nuclear whorls consisting of numerous fine flexuous retractive riblets, somewhat inequidistant, about 8 per millimetre; interstices with minute growth-striæ, reticulated by microscopic dense spiral lines. *Colour* fuscous, variegated with yellowish-white spots, principally about the suture and sometimes on the base. *Spire* high, cylindrical, 3 to $3\frac{1}{2}$ times the height of the aperture, apex subrotund. *Protoconch* of $1\frac{1}{2}$ smooth convex volutions. *Whorls* 7 to $7\frac{1}{2}$, rather convex, regularly increasing, the last high and somewhat ventricose; base convex. *Suture* impressed. *Aperture* subvertical, ovate, straight above. *Peristome* simple, straight, margins remote. *Columella* subvertical, almost straight. *Inner lip* slightly dilated above. *Perforation* narrow, not deep.

Diameter, 2 mm.; height, 4·75 mm. (type).

Animal nearly white; the oculiferous tentacles greyish-black, clavate, long (about 3 mm.); the tentacles short (about $\frac{1}{2}$ mm.), white, rounded in front. Mantle central; neck with 2 blackish stripes running backwards from the eye-peduncles; tail sharp above, slightly tapering, without mucous pore. There is a distinct peripodial groove, to which run down the whole length of the foot shallow diagonal grooves. Sole white, with a slightly darker median field. Length of body, 9 mm.; breadth of sole, 1·25 mm.

Dentition.—Suter, T.N.Z.I., xxiv, 300, pl. 23, f. 53, 54.

Jaw arcuate, ends blunt, with distant vertical striæ; upper margin roundly denticulated, a blunt median projection on the cutting-edge.

Radula having the formula $90 \times 11 + 5 + 1 + 5 + 11$. Central tooth quadrate, tricuspid, the mesocone reaching to within a short distance of the posterior end of the base; side cusps each with a small cutting-point. Lateral teeth somewhat larger than the central, tricuspid, the mesocone extending a little over the next row of teeth. Marginals broader than long, the sixth to twelfth tooth tridentate, the mesocone being the largest, the thirteenth to fifteenth with 4 denticles, of which the inner second is somewhat longer, last marginal with 1 cutting-point.

Type in the British Museum.

Hab.—North Island : Gisborne (A. Hamilton) ; Waimarama (Gillies) ; Napier (Meinertzhagen) ; Dannevirke ; Ormondville ; Forty-mile Bush (H. S.) ; Paekakariki (A. Hamilton) ; Petone ; Wellington (H. S.). South Island : Happy Valley, Stonyhurst (F. Suter).

Subgen. 4. ÆSCHRODOMUS, Pilsbry, 1892.

Æschrodomus, Pilsbry, "The Nautilus," vi, Sept. 1892, 55. Type : *Helix stipulata,* Reeve. *Thera,* Hutton, T.N.Z.I., xvi, 1884, 193 ; not of Stephens, 1831. *Æschrodomus,* Pilsbry, Man. Conch. (2), ix, 30.

Animal like that of *Charopa coma ;* mantle subcentral, slightly reflected over the peristome ; eye-peduncles long and cylindrical ; tail short, pointed, without mucous pore.

Jaw thin, broadly and faintly vertically striated.

Radula with the central and lateral teeth tricuspid, marginals tri- and quadri-cuspid.

Shell elevated, dome-shaped, the height about equal to the diameter ; whorls rather narrow, the protoconch distinct, light-coloured, smooth or spirally striate ; the succeeding whorls sculptured with oblique lamellar riblets, which bear hairs where they cross the angular periphery ; base flattened ; umbilicus small but open ; aperture toothless ; the peristome thin, simple.

Distribution.—New Zealand.

KEY TO SPECIES.

A. Adult shell with 7 whorls ; hairs with a narrow membranous base ; suture margined ; umbilicus one-sixth of greatest diameter. Diameter = height .. .. *barbatula.*

B. Adult shell with 5½ whorls ; hairs with a broad membranous base ; suture not margined ; umbilicus one-quarter of greatest diameter. Diameter greater than the height .. .. *stipulata.*

1. Endodonta barbatula, Reeve, 1852. Plate 27, fig. 14, *a.*

Helix barbatula, Reeve, Conch. Icon., vii, pl. 132, f. 814. *Charopa* (*Æschrodomus*) *barbatula,* Reeve : Hedley and Suter, P.L.S. N.S.W. (2), vii, 660. *Endodonta* (*Æschrodomus*) *barbatula,* Reeve : Suter, J. de Conch., xli, 273. *Helix beta,* Pfeiffer, M.H. Viv., iii, 112 ; P.Z.S., 1852 (1854), 58 ; Küster, Conch. Cab., i, pt. 2, 462, pl. 155, f. 53–56 ; Hector, Cat. Land. Moll. N.Z., 16. *Patula* (*Charopa*) *beta,* Pfr., Nomencl. Hel. Viv., 98. *Helix beta,* Pfr. : Hutton, M.N.Z.M., 18. *Thera barbatula,* Reeve : Suter, T.N.Z.I., xxiv, 285. *Helix beta,* Pfr. : Tryon, Man. Conch. (2), iii, 95, pl. 19, f. 2.

Shell small, conical, umbilicated, keeled, radially ribbed, and with fine horny bristles at the keel of the whorls. *Sculpture* consisting of arcuate retractive membranous riblets, about 6 per millimetre, produced into moderately long thin hairs, very narrowly broadened at their bases ; interstices with minute growth-lines, crossed by indistinct dense microscopic spiral striæ. *Colour* fulvous, broadly spotted with chestnut. *Spire* high, conical, the apex dome-shaped, its height about 3½ times that of the aperture. *Protoconch* convex, of 1½ smooth

and rounded whorls. *Whorls* 7, narrow, keeled at about the lower fourth of the volutions, flattish above, the last somewhat receding; base flatly convex. *Suture* impressed, margined. *Aperture* subvertical, angularly rounded, flat above. *Peristome* simple, straight, angled below. *Columella* vertical, lip slightly expanded. *Umbilicus* narrow, deep, about one-sixth of the greatest diameter.

Diameter, 3·3 mm.; height, 3·3 mm. (type).

Dentition.—Suter, T.N.Z.I., xxiv, 296, pl. 22, f. 36, 37.

Jaw almost straight, convex on the upper, straight on the lower margin; very thin, fragile, and transparent; broadly and faintly vertically striated, the cutting-edge slightly and broadly denticulated.

Radula having the formula $100 \times 15 + 1 + 15$; laterals 6–7. Central tooth rectangular, tricuspid, with a short mesocone and small side cusps. Laterals also tricuspid, the mesodont reaching beyond the base, the entocone larger than the ectocone. Marginals much broader than long, first tridentate, the outer teeth quadridentate.

Type in the British Museum.

Hab.—South Island: Springburn (Professor Dendy); Dunedin (A. Hamilton); Saddle Hill, Taieri (E. Suter); near Lake Te Anau (Professor Dendy).

2. **Endodonta stipulata**, Reeve, 1852. Plate 27, fig. 15, *a*.

Helix stipulata, Reeve, Conch. Icon., vii, pl. 132, f. 813. *Thera stipulata*, Reeve: Hutton, T.N.Z.I., xvi, 193. *Charopa* (*Æschrodomus*) *stipulata*, Reeve: Hedley and Suter, P.L.S. N.S.W. (2), vii, 659. *Endodonta* (*Æschrodomus*) *stipulata*, Reeve: Suter, J. de Conch., xli, 272, pl. 9, f. 4; Pilsbry, Man. Conch. (2), ix, pl. 6, f. 67, 68. *Helix alpha*, Pfeiffer, M.H. Viv., iii, 1853, 112; P.Z.S., 1852 (1854), 58; Hector, Cat. Land Moll. N.Z., 16; Hutton, M.N.Z.M., 18. *Patula* (*Charopa*) *alpha*, Pfr., Nomencl. Hel. Viv., 98. *Helix alpha*, Pfr.: Tryon, Man. Conch. (2), iii, 94, pl. 19, f. 1.

Shell small, dome-shaped conical, umbilicated, keeled or sharply angled, costate, with membranous plaits ending in short hairs. *Sculpture* consisting of somewhat inequidistant arcuate retractive riblets on the post-nuclear whorls, produced on the lower part into a broadly triangular membrane, ending in a rather short hair; interstices with very numerous minute growth-striæ crossed by microscopic dense spiral lines visible on all whorls, protoconch included. *Colour* brown, variegated with yellowish-white streaks. *Spire* rather convexly conical, apex obtuse, about $2\frac{1}{2}$ times the height of the aperture. *Protoconch* convex, of $1\frac{1}{2}$ rounded whorls, the spiral striation sometimes inconspicuous. *Whorls* $5\frac{1}{2}$, slightly convex, angled above the suture, the body-whorl keeled or sharply angled at the periphery, somewhat receding; base flattish. *Suture* deep. *Aperture* diagonal, somewhat hatchet-shaped. *Peristome* simple, straight, upper margin short, basal lip arcuated. *Columella* vertical, slightly dilated above. *Umbilicus* moderate, open, about a quarter of the greatest diameter, deep.

Diameter—Maj., 4·3 mm.; min., 4 mm.: height, 3 mm. (type).

Animal.—Hutton, T.N.Z.I., xvi, 168.

Dentition (Hutton, T.N.Z.I., xvi, 168, pl. 11, f. B, L.; Suter, *l.c.*, xxiv, 296, pl. 22, f. 34, 35).—Formula of radula varying from 12 + 1 + 12 to 16 + 1 + 16. Jaw and teeth very similar to those of the foregoing species.

Hab.—North Island: Thames (Adams); Petane, near Napier (*fide* Hutton). South Island: Greymouth (Helms); Temuka (Professor Chilton); Dunedin and Queenstown (Captain Hutton); Owaka, Clutha (Bryant); Taieri (E. Suter); The Nuggets (A. Hamilton); Fortrose (Miss Rich).

Remarks.—The North Island habitat wants confirmation. I think the species is precinctive to the South Island.

Subgen. 5. Charopa. Albers, 1860.

Charopa, Albers, "Die Heliceen," ed. 2, 87. Type: *Helix coma*, Gray. *Charopa*, Pilsbry, Man. Conch. (2), viii, 96, ix, 31. *Simplicaria*, Mousson, MS.: Suter, T.N.Z.I., xxiii, 90.

Animal small, the mantle rather posterior, tail not or not much produced behind the shell. Eye-peduncles large, club-shaped, approximated at their bases; tentacles short. Foot margined by a parapodial groove.

Jaw delicate, thin, more or less arcuate, subvertically striate.

Radula having the central tooth tricuspid, side cusps small. Laterals similar, the entocone becoming larger outwardly until it becomes joined at the base with the mesocone. Marginals low and wide, tricuspid.

Reproductive organs simple.

Shell depressed, subdiscoidal, the spire varying from convex to concave; openly umbilicated; whorls rather cylindrical, the last rounded or subangular (never keeled) at the periphery; surface sculptured with oblique or sigmoid rib-striæ; unicoloured or painted with radiating reddish flames; aperture lunate, oblique, the lip thin and simple, more or less sinuous; parietal wall covered by a varnish of callus, the riblets being removed by absorption.

The species are numerous, and they occupy a vast territory; New Zealand, Polynesia, and New Caledonia are their especial home. In my opinion, only very few of the Tasmanian and Australian species assigned to *Charopa* really belong to it. Recently discovered in Natal.

1. *Group of* Endodonta coma.

Shell having a *smooth protoconch*. Riblets more or less arcuate, retractive; interstices without or with microscopic spiral lines, often indistinct; umbilicus wide.

KEY TO SPECIES.

A. Interstices between the riblets with microscopic spiral lines, often rather indistinct.
- *a.* Riblets about 2 per millimetre, their number, however, somewhat variable; spirals distinct; 5½ whorls; dimensions, 7 mm. by 3 mm. .. .. .. *coma.*
- *b.* Riblets 9–10 per millimetre; spirals mostly indistinct: umbilicus one-third of diameter; 4 whorls; dimensions, 3¾ mm. by 1¾ mm. .. .. .. *titirangiensis.*
- *c.* Riblets 11–13 per millimetre; spirals very indistinct; 5 whorls; dimensions, 3¾ mm. by 1¾ mm. .. .. *montivaga.*
- *d.* Riblets 15 per millimetre; spirals indistinct; umbilicus one-quarter of diameter; 4 whorls; dimensions, 3½ mm. by 1½ mm. .. .. *ochra.*
- *e.* Riblets 20 per millimetre; spirals indistinct; umbilicus one-quarter of diameter; 3¼ whorls; dimensions, 2 mm. by 0·8 mm. .. .. *chrysaugeia.*
- *f.* Riblets 30 per millimetre; spirals distinct; umbilicus one-third of diameter; 5 whorls; dimensions, 2·6 mm. by 1·4 mm. .. .. *Benhami.*

B. Interstices without microscopic spiral lines.
- *a.* Riblets 5–8; umbilicus two-fifths of diameter; 5 whorls; dimensions, 5½ mm. by 2½ mm. .. .. .. *pseudocoma.*
- *aa.* Riblets 11–15 per millimetre.
  - *b.* Riblets 11 per millimetre; umbilicus nearly one-half of diameter; 5½ whorls; dimensions, 4·3 mm. by 2·2 mm. .. .. *multicostata.*
  - *bb.* Riblets 13–15 per millimetre; umbilicus one-third of diameter; 4½ whorls; dimensions, 2·3 mm. by 1 mm. .. .. *anguiculus.*
  - *bbb.* Riblets 15 per millimetre; umbilicus one-third of diameter; 4 whorls; dimensions, 2¾ mm. by 1¼ mm. *montana.*
- *aaa.* Riblets 18–20 per millimetre; umbilicus one-quarter of diameter; 4 whorls; dimensions, 2½ mm. by 1 mm. .. *Bianca.*

1. Endodonta anguiculus, Reeve, 1852. Plate 27, fig. 16, *a*, *b*.

Helix anguiculus, Rve., Conch. Icon., vii, pl. 131, f. 802; M.H. Viv., iii, 634; Hector, Cat. Land Moll. N.Z., 14. *Patula* (*Charopa*) *anguiculus*, Rve., Nomencl. Hel. Viv., 98. *P. anguiculus*, Rve.: Hutton, M.N.Z.M., 9; T.N.Z.I., xvi, 192. *Helix* (*Patula*) *anguiculus*, Rve.: Tryon, Man. Conch. (2), iii, 23, pl. 3, f. 13. *Charopa anguiculus*, Rve: Hedley and Suter, P.L.S. N.S.W. (2), vii, 655. *Endodonta* (*Charopa*) *anguiculus*, Rve.: Suter, J. de Conch., xli, 263. *Helix theta*, Pfeiffer, ined.

Shell minute, subdiscoidal, umbilicated, closely radiately ribbed, dark brown with subequidistant white streaks, thin, not shining. *Sculpture* of the post-nuclear whorls consisting of fine and close slightly retractive radial riblets, sinuous on periphery and base, 13 to 15 per millimetre; interstices with a few growth-lines, but no spirals. *Colour* rufous, with fairly regularly spaced white radial streaks, some of which extend to the base. *Spire* flat or slightly elevated. *Protoconch* of 1¾ whorls, smooth, convex. *Whorls* 4½ to 5, convex, slowly and regularly increasing, periphery and base rounded, sometimes the last is very slightly descending in front. *Suture* impressed. *Aperture* oblique, rotundly lunate. *Peristome* thin and sharp; margins con-

verging; outer lip with a slight sinus at the periphery. *Columella* short, oblique. *Inner lip* not reflexed; parietal wall with a broad thin shining glaze. *Umbilicus* wide, deep, broadly conical, about one-third of the greatest diameter.

Diameter—Maj.. 2·3 mm.; min., 2 mm.: height, 1 mm., with 4½ whorls.

Animal darkish-grey, the foot white with a grey patch on the back behind the shell.

Jaw membranous, very delicate.

Dentition.—Radula having the formula 11 + 1 + 11; laterals 5. Central and lateral teeth tricuspid, marginals with 3 to 4 cusps.

Type in the British Museum.

Hab.—North Island: Mount Wellington lava-fields (H. S.); Hunua Range (Major Broun); Mount Pirongia (Urquhart); Toko, near Stratford; Wanganui (R. Murdoch); Forty-mile Bush (H. S.). South Island: Kenepuru (McMahon); Nelson; Greymouth; Oxford; Kowai Bush (Professor Chilton); Governor's Bay, near Lyttelton (H. S.); Stonyhurst (F. Suter); Otarama (A. Suter); Mount Somers (W. W. Smith); The Nuggets, Port Molyneux (A. Hamilton). Auckland Islands (Dr. H. Krone).

Subsp. montivaga, Suter. 1894. Plate 10, figs. 15, 15*a*, 15*b*.

Charopa anguiculus, Reeve, var. *montivaga*, Sut., P.L.S. N.S.W. (2), viii, 1894, 498, pl. 23, f. 11, 11*b*. *Endodonta* (*Charopa*) *anguiculus*, subsp. *montivaga*, Suter, J. de Conch., xli, 264. *Patula buccinella*, Reeve: Hutton, T.N.Z.I., xvi, 192; not of Reeve.

Shell small, subdiscoidal, umbilicated, faintly shining, thin and semitransparent, radially closely ribbed, brown with lighter streaks. *Sculpture* of the post-embryonic whorls consisting of close arcuate radiate riblets, 11–13 per millimetre, flexuous and slightly retractive towards the periphery; interstices with fine growth-lines and traces of fine microscopic spiral striæ. *Colour* dark fulvous, with or without some irregular narrow streaks of horny. *Spire* low, almost flat. *Protoconch* of 1½ smooth convex turns. *Whorls* 5, slowly and regularly increasing, rounded. *Suture* impressed. *Aperture* oblique, rotundly lunate. *Peristome* thin and sharp. *Columella* somewhat oblique, arcuate. *Umbilicus* broad, perspective, about two-fifths of the greatest diameter.

Diameter—Maj., 3·75 mm.; min., 3·5 mm.: height, 1·75 mm.

Dentition (Hutton, T.N.Z.I., xvi, 163, pl. 9, f. D).—Very similar to that of the species.

Hab.—North Island: Waitakerei Range; Auckland (H. S.); Waikato (W. W. Smith); Ohaupo (Musson); Ngaputahi, Tuhoe-land (A. Hamilton); Hawke's Bay (W. Colenso); Dannevirke (Brooks); Forty-mile Bush, type (H. S.). South Island: Stonyhurst (F. Suter); Riccarton Bush; Little River (H. S.); Otarama (A. Suter); Hooker Valley; Dunedin (H. S.); Saddle Hill, Taieri (E. Suter); The Nuggets, Port Molyneux (A. Hamilton); Fortrose (Miss Rich).

Var. fuscosa, Suter, 1894.

Charopa anguiculus, Reeve, var. *fuscosa*, Sut., T.N.Z.I., xxvi, 1893 (1894), 135. *Endodonta* (*Charopa*) *anguiculus*, var. *fuscosa*, Suter, J. de Conch., xli, 264.

The shells at my disposal are not adult, the largest having only $3\frac{1}{2}$ whorls, but when adult have most likely about the same dimensions as the species. The shell has a smooth protoconch, the radiate riblets (15 per millimetre) are flexuous, and the interstices very distinctly microscopically reticulated. The colour is uniformly fuscous.

Diameter, 1·7 mm. ; height, 0·9 mm., with $3\frac{1}{2}$ whorls.

Type in my collection.

Hab.—Hunua Range (Major T. Broun).

2. Endodonta Benhami, Suter, 1909. Plate 27, fig. 17. *a*, *b*.

Endodonta (*Charopa*) *Benhami*, Suter, Subantarct. Islds. N.Zeal., i, 1909, 37, pl. 1, f. 12–14.

Shell very small, subdiscoidal, umbilicated, finely ribbed, thin and fragile. *Sculpture* of the post-embryonic whorls consisting of very fine slightly flexuous radial riblets, about 30 per millimetre ; the interstices microscopically reticulated by fine growth and spiral striæ. *Colour* uniformly light chestnut-brown. *Epidermis* thin, not shining. *Spire* flat, but little elevated above the last volution. *Protoconch* of $1\frac{1}{2}$ smooth and convex whorls. *Whorls* 5, very narrowly wound up, regularly increasing, moderately convex, periphery and base rounded. *Suture* very deep. *Aperture* somewhat oblique, semilunar. *Peristome* regularly rounded, simple, sharp and thin. *Columella* very short, vertical, arcuate. *Inner lip* not callous and not reflexed. *Umbilicus* broad, deep, and perspective, about one-third of the greatest diameter.

Diameter—Maj., 2·6 mm. ; min., 2·4 mm. : height, 1·4 mm.

Animal unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—Auckland Islands, under logs (Professor Benham).

3. Endodonta Bianca, Hutton, 1883. Plate 27, fig. 18, *a*.

Patula Bianca, Hutt., N.Z.J.S., i, 1883, 475 ; T.N.Z.I., xvi, 175, 192. *P.* (*Charopa*) *Bianca*, Hutt. : Pilsbry, Man. Conch. (2), viii, 97, pl. 37, f. 41, 42. *Charopa Bianca*, Hutt. : Hedley and Suter, P.L.S. N.S.W. (2), vii, 655. *Endodonta* (*Charopa*) *Bianca*, Hutt. : Suter, J. de Conch., xli, 267.

Shell minute, discoidal, umbilicated, finely ribbed, brown, thin, not shining. *Sculpture* of the post-embryonic whorls consisting of very fine delicate oblique and slightly retractive riblets, 18 to 20 per millimetre ; interstices with fine growth-lines, but no spirals. *Colour* horny-brown, banded with darker. *Spire* flat or slightly convex. *Protoconch* of $1\frac{1}{4}$ smooth convex turns. *Whorls* $3\frac{1}{2}$ to 4, convex.

the last more rapidly increasing than the others; periphery and base rounded. *Suture* impressed. *Aperture* slightly obl que, rotundly lunate. *Peristome* thin, regularly arched. *Columella* short, arcuate. *Inner lip* slightly expanded; parietal wall with a thin shining glaze. *Umbilicus* broad, gradate, about a quarter of the greatest diameter.

Diameter—Maj., 2·5 mm.; min., 2·25 mm.: height, 1 mm.

Dentition (Suter, T.N.Z.I., xxiv, 292, pl. 21, f. 20, 21).—Radula having the formula 7+4+1+4+7. Central and lateral teeth tricuspid; marginals with 3 to 4 cutting-points.

Jaw membranous, slightly arcuated, not tapering, faintly vertically striated, with a slight median projection at the cutting-edge.

Type in the Canterbury Museum, Christchurch.

Hab.—North Island: Wade; Titirangi (H. S.); Thames (Adams); Heretaunga (Brooks); Waimarama (A. Hamilton); Toko, near Stratford (R. Murdoch); Ngaputahi (A. Hamilton); Forty-mile Bush (H. S.); Horokiwi; Dannevirke; Otaki Gorge (Preston); Whangarei (A. Suter). South Island: Kenepuru (McMahon); Greymouth, type (Helms); Bealey (Haast); Akaroa (F. Suter); Riccarton Bush (H. S.); Mount Somers (W. W. Smith); Nelson; Hooker Valley (H. S.); The Nuggets, Port Molyneux (A. Hamilton). Stewart Island: Half-moon Bay (A. Hamilton).

Var. montana, Suter, 1891.

Patula Bianca, Hutt., var. *montana*, Sut., T.N.Z.I., xxiii, 88. *P.* (*Charopa*) *Bianca*, Hutt., var. *montana*, Sut.: Pilsbry, Man. Conch. (2), viii, 97. *Charopa Bianca montana*, Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 655. *Endodonta* (*Charopa*) *Bianca montana*, Sut., J. de Conch., xli, 268.

Shell differs from the species by its larger size, the somewhat coarse and more distant riblets, which number about 15 per millimetre, and the darker colour, this being fuscous without any streaks. Protoconch also smooth, and interspaces between the riblets without spirals. The umbilicus is slightly wider, about one-third of the greatest diameter.

Diameter, 2·75 mm.; height, 1·25 mm.

Dentition (Suter, *t.c.*, 88, pl. 17, f. K, L).—Jaw and radula are very much like those of the species: the formula of the radula is 13 + 1 + 13; laterals 4 to 5.

Type in my collection.

Hab.—South Island: Hooker Valley, type (H. S.); Kenepuru (McMahon).

4. Endodonta chrysaugeia, Webster, 1904. Plate 27, fig. 19, *a*.

Endodonta (*Charopa*) *chrysaugeia*, Webster, P. Mal. S., vi, 1904, 107, f. 3, 3*a* in text p. 106.

Shell minute, discoidal, umbilicated, brown, very finely radiately ribbed, silky. *Sculpture* of the post-embryonic whorls consisting of

very fine and close radiate riblets, about 20 per millimetre, straight from the suture, slightly retractive at the periphery, and straight on the base; interstices with a few growth-lines and not very distinct microscopic dense spiral lines. *Colour* golden-brown. *Spire* flat. *Protoconch* of 1½ convex and smooth turns. *Whorls* 3¼, rather rapidly increasing, convex; periphery and base rounded. *Suture* well impressed. *Aperture* rotundly lunate, slightly oblique. *Peristome* thin, straight, regularly arched, margins converging. *Columella* very short, arcuate. *Inner lip* not thickened and not reflexed; parietal wall with a thin white glaze. *Umbilicus* moderate, deep, conical, about a quarter of the greatest diameter.

Diameter, 2 mm.; height, 0·8 mm.

Animal with the foot bright orange.

Dentition unknown.

Type in Mr. Webster's collection.

Hab.—North Island: Waiuku, scarce, type (Webster); Waitakerei Range (H. S.).

5. **Endodonta coma**, Gray, 1843. Plate 27, figs. 20, *a*, *b*.

Zonites coma, Gray, Dieff. N.Z., 263; M.H. Viv., i, 113. *Helix coma*, Gray, M.H. Viv., iii, 99: Conch. Cab. (2), i, 461, pl. 154, f. 37–39: Reeve, Conch. Icon., vii, pl. 130, f. 796; pl. 131, f. 800: Ereb. & Ter., 1, pl. 1, f. 3: Man. Conch. (2), iii, 22. *H.* (*Charopa*) *coma*, Gray: Hector, Cat. Land Moll. N.Z., 11. *Patula coma*, Gray: Hutton, M.N.Z.M., 8; T.N.Z.I., xvi, 191. *Endodonta* (*Charopa*) *coma*, Gray: Pilsbry, Man. Conch. (2), ix, pl. 6, f. 57–59; pl. 9, f. 23, 24: Hedley and Suter, P.L.S. N.S.W., vii, 653: Suter, J. de Conch., xli, 261.

Shell small, depressed, widely umbilicated, rather thin, obliquely rather distantly ribbed, streaked with brown and whitish. *Sculpture* of the post-nuclear whorls consisting of oblique flexuous radial riblets, distinctly retractive at the periphery, about 2 per millimetre, but their number is very variable; the interstices with microscopic fine growth-lines and spiral liræ. *Colour* horny, with radial brown flames, which are of a lighter tint on the base. *Epidermis* thin, horny, faintly shining. *Spire* a little elevated, flatly convex. *Protoconch* of 1½ convex and smooth turns. *Whorls* 5 to 5½, rather convex, slowly increasing, the last obscurely angled at the periphery; base convex. *Suture* impressed. *Aperture* diagonal, lunately rotund. *Peristome* simple, straight, margins slightly convergent, upper part very slightly bent backwards. *Columella* short, vertical, arcuate. *Inner lip* a little expanded, not thickened, forming a thin shining glaze on the parietal wall. *Umbilicus* broad, conical, showing all the whorls.

Diameter—Maj., 7 mm.; min., 6 mm.: height, 3 mm. (type).

Animal small, mantle rather posterior, the tail not produced behind the shell; eye-peduncles large, clavate, approximated at their bases; the tentacles short. Yellowish-white, eye-peduncles and a stripe down each side of the head dark purple. (Hutton.)

Jaw (Plate 1, fig. 17) finely striated, arcuated, with a slight median projection.

Radula (Plate 1, fig. 17) having the formula 13 + 1 + 13, varying from 12 to 15; laterals 4 or 5. Central tooth tricuspid, the mesocone reaching about to the posterior border of the basal plate, side cusps small. Laterals similar, but somewhat asymmetrical, the entocone becoming larger outwardly until it becomes joined at the base with the mesocone. The marginals are very low and wide, by shortening of the basal plates; tricuspid, the ento- and meso-cone often joined at base; ectocone smaller, simple or split into two. Cusps variously degenerate on the outermost marginals.

Type in the British Museum.

Hab.—North Island: Whangarei; Hokianga; Waitakerei Range; Little and Great Barrier Islands; Waiwera; vicinity of Auckland; Waiheke Island; Ohaupo; Manawatu Gorge; Mount Pirongia; Dannevirke; Heretaunga; Wanganui; Tuhoe-land; Forty-mile Bush; Wellington. South Island: Kenepuru; near Lake Guyon; Stonyhurst; Bealey; Springburn; Otorama; Reefton; Hossack Downs; near Lake Mahinapua. It does not occur in Tasmania.

This is the most common of our land-shells, living under bark, wood, and dead leaves in the native bush.

Fossil in the Pleistocene of Petane.

Forma albina.

White specimens, from Kenepuru, are in my collection. Only one specimen shows traces of light-brown streaks on the earlier whorls, the others having no colour-markings at all.

Var. globosa, Suter, 1892.

Patula coma globosa, Sut., T.N.Z.I., xxiv, 273. *Helix coma*, var. *β*, Pfeiffer, M.H. Viv., iii, 99; Conch. Cab. (2), i, 461. *Patula* (*Charopa*) *coma*, var. *globosa*, Sut., Man. Conch. (2), viii, 96. *Charopa coma*, var. *beta*, Pfr., and var. *globosa*, Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 653. 654. *Endodonta* (*Charopa*) *coma globosa*, Sut., J. de Conch., xli, 262.

Differs from the species in the much more elevated broadly rounded conoidal spire, and the narrower umbilicus.

The dimensions of an adult specimen of 5½ whorls are:—Diameter —Maj., 6·5 mm.; min., 5·7 mm.: height, 4 mm.: diameter of the umbilicus, 2 mm.

Hab.—Wanganui; Dannevirke; Mauriceville; Paekakariki; Wellington.

Var. multicostata, Murdoch, 1897.

Endodonta (*Charopa*) *coma*, Gray, var. *multicostata*, Murd., P. Mal. S., ii, 1897, 161, figs. in text.

Shell small, subdiscoidal, umbilicated, pale fuscous with a few pale-brown spots, dull, thin, and semitransparent. *Sculpture* consisting of slightly curved close ribs, about 11 per millimetre, curving

slightly backward until they cross the periphery, straight on the base; interstices between the ribs ornamented with fine growth-lines. *Spire* a little elevated, flatly convex. *Protoconch* smooth. *Whorls* $5\frac{1}{2}$, convex, slowly and regularly increasing. *Suture* not deep. *Aperture* oblique, lunately rotund. *Peristome* straight, acute. *Umbilicus* broad, conical, nearly half the diameter, showing all the volutions; base rounded.

Diameter, 4·3 mm.; height, 2·2 mm.

Type unfortunately lost.

Hab.—Wanganui (R. Murdoch); Ruatahuna (E. Best).

Remarks.—The ribs are firm, and much closer together than in *E. coma* and *E. pseudocoma*. It may prove to be a distinct species, but, with only a dead single example for comparison, it seems better to unite it with *E. coma*, to which in many respects it is closely allied. (Murdoch.)

6. **Endodonta ochra**, Webster, 1904. Plate 27, figs. 21, *a*, *b*.

Endodonta (*Charopa*) *ochra*, Webster, P. Mal. S., vi, 1904, 107, f. 2, 2*a* in text p. 106.

Shell small, depressed, umbilicate, light brown, with close radiate riblets, thin, slightly shining. *Sculpture* of the post-embryonic whorls consisting of fine close radiate riblets, about 15 per millimetre, which are slightly retractive, oblique near the suture, slightly arcuate at the periphery, almost straight and flexuous on the base; the interstices with a few growth-lines, and rather indistinct fine and close microscopic striæ. *Colour* shining gold when first matured, becoming wan and creamy with age. *Spire* slightly raised, broadly convex. *Protoconch* of $1\frac{3}{4}$ whorls, smooth, convex. *Whorls* 4 to $4\frac{1}{4}$, convex, regularly increasing, periphery and base rounded. *Suture* impressed. *Aperture* oblique, rotundly lunate. *Peristome* simple, acute, margins converging. *Columella* vertical, arcuate. *Inner lip* thin, not reflexed; parietal wall with a very thin white glaze. *Umbilicus* moderately wide, about a quarter of the greatest diameter, deep, gradate.

Diameter, 3·5 mm.; height, 1·5 mm.

Animal having the foot bright yellow.

Dentition unknown.

Type in Mr. Webster's collection.

Hab.—North Island: Waiuku, common, type (Webster); Birkenhead (A. Suter); near Henderson (H. S.).

7. **Endodonta pseudocoma**, Suter, 1894. Plate 27, figs. 22, *a*, *b*.

Charopa pseudocoma, Sut., P.L.S. N.S.W. (2), viii, 495, pl. 23, f. 9, *a–e*.
Endodonta (*Charopa*) *pseudocoma*, Suter, J. de Conch., xli, 271.

Shell small, discoidal, broadly umbilicated, fuscous, radially costate, not shining, thin, semitransparent. *Sculpture* of the post-nuclear whorls consisting of somewhat unequal obliquely retractive radial

riblets, strongly flexuous on the periphery, about 5 to 8 per millimetre; the interstices with fine microscopic growth-lines; there is no spiral sculpture. *Colour* fuscous with a greenish hue, either with distant irregular radiate brown streaks extending in zigzag lines to the umbilicus, or without any markings. *Epidermis* thin, horny, dull. *Spire* mostly flat, rarely a little raised. *Protoconch* of 1½ whorls, quite smooth, flat, horn-colour. *Whorls* 5, rather flattened, especially the first four, slowly and regularly increasing, periphery subangled; base convex. *Suture* impressed. *Aperture* lunate, subtriangular, oblique. *Peristome* simple, sharp, retracting below. *Columella* short, oblique, arcuate. *Inner lip* slightly thickened and expanded, forming a thin whitish and polished layer on the parietal wall. *Umbilicus* broad, conical, perspective, about two-fifths of the greatest diameter.

Diameter—Maj., 5½ mm.; min., 5 mm.: height, 2·5 mm.

Animal small, yellowish-white. Eye-peduncles rather large, clavate, blackish, a narrow black stripe extending along the neck to the mantle. Tentacles short, rather stout, rounded in front. The neck is transversely grooved. The whole length of the foot is bordered by a distinct pedal line, and to it run over the whole length of the body diagonal grooves. Mantle rather posterior; tail short, rounded, tapering, without mucous pore, and not extending beyond the shell. Sole uniformly whitish, smooth.

Jaw very thin, membranaceous; the upper margin arcuate, the cutting-edge indistinct, almost straight.

Radula tongue-shaped, the transverse straight rows consisting of 16+1+16 teeth, of which 4–5 may be considered as laterals. Central tooth quadrangular, longer than broad, situated anteriorly, reflection tricuspid, the median long and reaching with its short cutting-point to the posterior end of the base; the side reflections are short, rounded, each with a rudimentary cutting-point. Laterals broader, almost quadrate, similar to the central tooth, but the mesial cutting-point is extending beyond the base over the next row of teeth. A few intermediate teeth show a shortening of the median reflection, its cutting-point is becoming stouter and longer, and the entocone is also increasing in size. Marginals short and very wide, first with 3 then with 4 teeth, the two inner ones long and stout, the outer ones remaining small. Last marginal minute, quadrate, bidentate.

Type in my collection.

Hab.—North Island: Poverty Bay (A. Hamilton). South Island: Akaroa (type); Little River; Dyer's Pass; Riccarton Bush (H. S.).

Remarks.—This species is distinguished from *E. coma* by its smaller size, the darker colour and its greenish hue, the very frequent absence of any colour-markings, and, if present, their zigzag form on the base. The ribs are closer and finer, the spire nearly always flat, and the umbilicus wider. It is more constant in form than *E. coma.*

8. Endodonta titirangiensis, Suter, 1896. Plate 10, figs. 6, *a*, *b*.

Endodonta (*Charopa*) *titirangiensis*, Suter, P. Mal. S., ii, 1896, 35, pl. 4, f. 8–10.

Shell small, discoidal, umbilicated, thin, horn-colour, semitransparent, radially costate, dull. *Sculpture* of the post-nuclear whorls consisting of fine, not much raised, subequidistant and retractive riblets, 9 to 10 per millimetre, slightly arcuate on the periphery, straight on the base; interstices with fine growth-lines and traces of microscopic spiral striæ. *Colour* horny, without colour-markings; protoconch white. *Spire* very little raised, flat. *Protoconch* of 1½ smooth convex volutions. *Whorls* 4, convex, the first three gradually increasing, the last attaining a relatively considerable development, taking up about one-third of the maximum diameter; periphery and base rounded. *Suture* well impressed. *Aperture* rotundly lunate, oblique. *Peristome* simple, sharp, slightly sinuate at the periphery. *Columella* short, arcuate. *Inner lip* not thickened, a little expanded; parietal wall with a broad white and thin callosity. *Umbilicus* moderately wide, gradate, about one-third of the greatest diameter.

Diameter—Maj., 3·75 mm.; min., 3·25 mm.: height, 1·75 mm.

Animal unknown.

Type in my collection.

Hab.—North Island: Titirangi, in Nikau Bush (type); Waitakerei Range, near Henderson (H. S.).

2. *Group of* Endodonta egesta.

Shell with radial riblets and very distinct spiral liræ. Protoconch smooth or spirally lirate.

Key to Species.

a. Radial riblets distant, 3 per 2 millimetres, membranous, with triangular lamellæ when fresh; spirals very distinct .. .. *egesta.*
b. Radial riblets 8–9 per millimetre; spirals very distinct .. .. *gaza.*
c. Radial riblets 18 per millimetre; fine spiral threads on the base .. *transenna.*

9. Endodonta egesta, Gray, 1850. Plate 28, fig. 1.

Helix egesta, Gray, P.Z.S., 1849 (1850), 166; M.H. Viv., iii, 102; Reeve, Conch. Icon., vii, pl. 131, f. 798; Conch. Cab. (2), i, 458, pl. 155, f. 18–20; Gray, A.M.N.H. (2), vii, 66. *H.* (*Charopa*) *egesta*, Gray: Hector, Cat. Land Moll. N.Z., 12. *H.* (*Patula*) *egesta*, Gray: Tryon, Man. Conch. (2), iii, 23, pl. 3, f. 15. *Patula egesta*, Gray: Hutton, M.N.Z.M., 8; T.N.Z.I., xvi, 193. *P.* (*Charopa*) *egesta*, Gray: Nomencl. Hel. Viv., 98. *Charopa egesta*, Gray: Hedley and Suter, P.L.S. N.S.W. (2), vii, 659. *Endodonta* (*Charopa*) *egesta*, Gray: Suter, J. de Conch., 262.

Shell small, depressedly semiglobose, umbilicated, with distant radial plaits, produced into membranous lamellæ, spirally distinctly lirate, blackish, rather solid. *Sculpture* consisting of equidistant oblique and retractive plaits, with a membranaceous subtriangular deciduous lamella on the spire-whorls, 2 on the body-whorl, one above

and one just below the periphery; the protoconch microscopically striate, succeeding whorls with distinct spiral cords, separated by narrow interstices; the spirals are crossed by very fine dense growth-lines. *Colour* black-rufous. *Epidermis* brown, dull, deciduous. *Spire* short, convex, above depressed. *Protoconch* of $1\frac{1}{2}$ convex whorls. *Whorls* 5 to $5\frac{1}{2}$, convex, the last tapering, generally inclining downwards; base convex. *Suture* deep. *Aperture* small, a little oblique, lunately circular. *Peristome* simple, straight, margins closely united. *Columella* vertical, arcuate. *Inner lip* not thickened and not reflexed. *Umbilicus* wide, perspective.

Diameter—Maj., 4·3 mm.; min., 4 mm.: height, 2·5 mm.

Anatomy.—Suter, J. Mal., vii, 52, pl. 3, f. 4–6.

Jaw thin and transparent, yellowish, arcuate, tapering at both ends, with a sharp concave cutting-edge, vertically distantly and faintly striated.

Radula having the formula 9 + 5 + 1 + 5 + 9. Central tooth tricuspid, with a short mesodont and minute side cusps. Laterals tricuspid, the mesodont long, the endodont with a longer and stouter cusp than the ectodont. Marginals low and wide, with longer entocone and mesocone, united at the base.

Reproductive Organs (Plate 1, fig. 18).—The albumen-gland is small, the free oviduct slightly contracted behind its middle, and the receptaculum seminis is inserted very little in front of the place where the vas deferens diverges from the common ducts. The verge sac is stout and rather short, the vas deferens enters in front of the posterior end, where the retractor muscle is attached, and the verge sac is contracted.

Foot without a caudal pore.

Type in the British Museum.

Hab.—Vicinity of Auckland, type (Greenwood): Waitakerei Range (H. S.).

10. **Endodonta gaza**, Suter, 1909. Plate 28, figs. 2, *a*, *b*.

Endodonta (Charopa) gaza, Sut., P. Mal. S., viii, 1909, 260, pl. 11, f. 22.

Shell small, depressed, broadly umbilicated, radially closely costate and spirally very distinctly lirate. *Sculpture* of the post-nuclear whorls consisting of equidistant close flexuous rather low radial riblets, about 8–9 per millimetre, the interstices with numerous microscopic growth-lines, crossed by equidistant narrow rounded spiral liræ, separated by well-impressed linear grooves. *Colour* fulvous, sometimes with a few radial whitish streaks. *Epidermis* thin, horny, not shining. *Spire* low, broadly conoidal, in some examples, however, nearly flat. *Protoconch* of $1\frac{1}{2}$ smooth convex whorls, flat. *Whorls* $5\frac{1}{2}$, rather slowly increasing, convex, the last flat above the periphery; base rounded. *Suture* deep. *Aperture* oblique, subtriangular, angled above, broadly rounded below. *Peristome* sharp, the outer lip very slightly advancing

and straight above the periphery, sharply rounded on meeting the broadly convex basal lip. *Columella* short, arcuate. *Inner lip* lightly callous, but little reflexed above, and spreading as a white smooth callus over the convex parietal wall. *Umbilicus* wide, perspective, diameter 1·7 mm.

Diameter—Maj., 4·5 mm. ; min., 4 mm. : height, 2 mm.

Animal unknown.

Type in my collection.

Hab.—Big King, Three Kings Islands (Captain Bollons).

11. Endodonta transenna, Suter, 1904. Plate 28, figs. 3, *a*, *b*.

Endodonta (*Charopa*) *transenna*, Suter, P. Mal. S., vi, 1904, 156, f. 4–6 in text.

Shell small, subdiscoidal, umbilicated, whitish with irregular streaks of chestnut, finely ribbed, with distinct revolving threads on base. *Sculpture :* The post-embryonic whorls are finely radially ribbed, the riblets low and undulating, about 18 per millimetre ; interstices with fine growth-lines, which are reticulated by spiral striæ, the latter distinctly visible on the base ; protoconch having a smooth nucleus, but the following half-turn is microscopically decussate. *Colour* nearly white, with irregular streaks and blotches of chestnut on the upper surface ; from the periphery down to the base there is a change in colour-pattern, smaller and zigzag lines predominating. *Spire* flat and very little raised above the last whorl. *Protoconch* of 1½ convex whorls. *Whorls* 5, at first very slowly then more rapidly and regularly increasing, convex ; periphery and base rounded. *Suture* well impressed. *Aperture* slightly oblique, roundly lunate. *Outer lip* regularly arched, sharp. The *columella* and *inner lip* arcuate, very little thickened, and not reflexed. *Umbilicus* wide, perspective ; diameter 1·2 mm., or somewhat less than one-third of the greater diameter of the shell.

Diameter—Maj., 3·2 mm. ; min., 2·9 mm. : height, 1·4 mm.

Animal unknown.

Type in my collection.

Hab.—Waitakerei Range, near Henderson (H. S.).

Remarks.—Unless closely examined, this species may easily be taken for *E. anguiculus* or *E. maculata*, but it can at once be separated from both by the distinct spiral threads on the base.

3. *Group of* Endodonta infecta.

Shell with radial riblets, protractive above the periphery and retractive toward the suture. Spire flattish ; umbilicus wide, perspective. Peristome retracting at the suture, forming a distinct sinus, advancing above and at the periphery. *Protoconch radially striate ;* sometimes smooth in *E. tapirina* and *subinfecta*.

KEY TO SPECIES.

A. Interstices between the riblets with very distinct microscopic spiral striæ.
  a. Riblets 8 to 10 per millimetre.
    1. Riblets 8 per millimetre; umbilicus one-third of diameter; 5 whorls; dimensions, 3 mm. by 1½ mm. *subinfecta.*
    2. Riblets 8–10 per millimetre; umbilicus one-quarter of diameter; 5 whorls; dimensions, 4 mm. by 2 mm. .. .. *Roseveari.*
    3. Riblets 10 per millimetre; umbilicus one-third of diameter; whorls 5; dimensions, 3 mm. by 1·3 mm. .. .. *buccinella.*
    4. Riblets 10–12 per millimetre; umbilicus wide, gradate; whorls 4; dimensions, 2·8 mm. by 1·3 mm. .. .. *caput-spinulæ.*
  b. Riblets 15 per millimetre; umbilicus one-third of diameter; whorls 5; dimensions, 2·7 mm. by 1¾ mm. .. *reeftonensis.*
  c. Riblets 20–24, but sometimes less, the spirals passing over them; umbilicus one-quarter of diameter; whorls 5; dimensions, 3·8 mm. by 2 mm. to 4½ mm. by 2½ mm. *Sterkiana.*
  d. Riblets 28–30 per millimetre.
    1. Riblets 28–30 per millimetre; sutural sinus not prominent; whorls 4; dimensions, 2 mm. by ¾ mm. .. .. *eremita.*
    2. Riblets 30 per millimetre; sutural sinus well pronounced; whorls 4½; dimensions, 2¼ mm. by 1 mm. .. .. *Brouni.*

B. Interstices between the riblets without or with indistinct microscopic spiral striæ.
  a. Interstices without spirals; riblets 8 per millimetre, every 3rd to 5th higher than the others; 5 whorls; dimensions, 4¾ mm. by 2¾ mm. .. .. .. *tapirina.*
  aa. Interstices with indistinct or obsolete spiral striæ.
    b. Riblets 6 to 10 per millimetre.
      1. Riblets 6–8 per millimetre; whorls 5; dimensions, 3 mm. by 1½ mm. .. .. .. *mutabilis.*
      2. Riblets 8–10 per millimetre; whorls 4¾; dimensions, 3 mm. by 1½ mm. .. .. *alpestris.*
      3. Riblets 10 per millimetre.
        c. Umbilicus one-third of diameter; whorls 5; dimensions, 4·2 mm. by 2¼ mm. .. *Colensoi.*
        cc. Umbilicus less than one-third of diameter; last whorl widened on approaching aperture; whorls 5½; dimensions, 3·7 mm. by 1½ mm. .. .. .. *infecta.*
    bb. Riblets 11 per millimetre: whorls 5; dimensions, 6 mm. by 2½ mm. .. .. *otagoensis.*
    bbb. Riblets 12–15 per millimetre.
      1. Riblets 12–13 per millimetre, irregularly developed; spirals more or less distinct; whorls 5; dimensions, 3 mm. by 1½ mm. .. *irregularis.*
      2. Riblets 15 per millimetre.
        c. Riblets equally developed; whorls 5; dimensions, 2½ mm. by 1¼ mm. .. *serpentinula.*
        cc. Riblets alternately one higher than the next; whorls 3¾; dimensions, 1·8 mm. by 1 mm. .. .. *variecostata.*

12. **Endodonta alpestris,** Suter, 1891. Plate 28, figs. 4, *a*, *b*.

Patula infecta, var. *alpestris,* Sut., T.N.Z.I., xxiii, 1890 (1891), 88. *P.* (*Charopa*) *zeta alpestris,* Sut.: Pilsbry, Man. Conch. (2), viii, 99. *Charopa infecta alpestris,* Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 658. *Endodonta* (*Charopa*) *infecta alpestris,* Sut., J. de Conch., xli, 266.

Shell very small, subdiscoidal, umbilicated, closely and sharply ribbed, cinereous with light brown, not shining. *Sculpture:* Protoconch with fine and close radial striæ, the succeeding whorls with rather close fine elevated and sharp riblets, 8 to 10 per millimetre; they are protractive at the suture, arcuate on reaching the periphery, thence straight, lightly flexuous; in some places the riblets are inequidistant; interstices with fine growth-lines and obsolete microscopic spiral lines. *Colour* cinereous, in some places rufous, with a few pale-horny streaks. *Spire* flattish, very little raised. *Protoconch* of $1\frac{1}{2}$ convex turns. *Whorls* $4\frac{3}{4}$, convex, regularly increasing, periphery and base rounded. *Suture* impressed. *Aperture* slightly oblique, rotundly lunate. *Peristome* thin, sharp, retracting towards the suture, and forming a not very conspicuous sinus. *Columella* very short, arcuate. *Inner lip* not thickened and not reflexed; parietal wall with a broad shining glaze. *Umbilicus* broad, deep, showing all the whorls, its diameter about one-third of the greatest diameter of the shell.

Diameter—Maj., 3 mm.; min., 2·7 mm.: height, 1·5 mm.

Animal unknown.

Type in my collection.

Hab.—White Horse Hill, Hooker Valley, South Island; among decaying leaves in the subalpine bush (H. S.).

13. **Endodonta Brouni,** Suter, 1891. Plate 9, figs. 17, *a*, *b*.

Patula Brouni, Sut., T.N.Z.I., xxiii, 1890 (1891), 86, pl. 16, f. 4, *a*, *b*, F, G. *Charopa Brouni,* Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 656. *Endodonta* (*Charopa*) *Brouni,* Sut., J. de Conch., xli, 271. *Patula* (*Charopa*) *Brouni,* Sut.: Pilsbry, Man. Conch. (2), viii, 102, pl. 19, f. 31–33.

Shell very small, subdiscoidal, umbilicated, not shining, thin and fragile, radially finely costate, pale with fuscous streaks. *Sculpture* consisting of close fine and sharp radial riblets, about 30 per millimetre, very little oblique on the protoconch, protractive on the following whorls at the suture, then curving forward and becoming nearly straight on the periphery and base; interstices with fine growth-lines, and excessively fine microscopic striæ. *Colour* pale-horny with rather distant fulvous streaks forming zigzag lines on the periphery and base. *Spire* very little raised, flattish. *Protoconch* of $1\frac{3}{4}$ convex whorls. *Whorls* $4\frac{1}{2}$, slowly increasing, convex, periphery and base rounded. *Suture* well impressed. *Aperture* slightly oblique, rotundly lunate. *Peristome* acute, thin; the outer lip distinctly advancing at the periphery, retractive toward the suture, and forming a well-marked

sinus. *Columella* short, arcuate. *Inner lip* not thickened nor reflexed; parietal wall with a thin shining glaze. *Umbilicus* wide, perspective, about one-third of the greater diameter.

Diameter, 2·25 mm.; height, 1 mm.

Jaw thin, arcuate, finely vertically striated.

Radula having the formula 10+4+1+4+10. Central tooth tricuspid, with a long mesocone. Laterals similar to the central tooth. Marginals broad, with 3 long cutting-points.

Type in my collection.

Hab.—Hooker Valley (type); Riccarton Bush (H. S.).

14. Endodonta buccinella, Reeve, 1852. Plate 28, figs. 5, *a*, *b*.

Helix buccinella, Reeve, Conch. Icon., vii, pl. 133, f. 821. *Charopa buccinella*, Reeve: Hedley and Suter, P.L.S. N.S.W. (2), vii, 654. *Endodonta* (*Charopa*) *buccinella*, Reeve: Suter, J. de Conch., xli, 262. *Helix gamma*, Pfeiffer, P.Z.S., 1852 (1854), 57; M.H. Viv., iii, 100. *Patula* (*Charopa*) *gamma*, Pfr., Nomencl. Hel. Viv., 98. *Helix* (*Charopa*) *gamma*, Pfr.: Hector, Cat. Land Moll. N.Z., 12. *Patula gamma*, Pfr.: Hutton, M.N.Z.M., 8. *Helix* (*Patula*) *gamma*, Pfr.: Tryon, Man. Conch. (2), iii, 23, pl. 3, f. 11. *Patula sylvia*, Hutton, N.Z.J.S., i, 1883, 476; T.N.Z.I., xvi, 175, 193. *P.* (*Charopa*) *sylvia*, Hutt.: Pilsbry, Man. Conch. (2), viii, 98. *Charopa tau*, Pfeiffer: Hedley and Suter, P.L.S. N.S.W. (2), vii, 657; Suter, *l.c.*, viii, 499; not of Pfeiffer.

Shell very small, depressed, umbilicated, thin, closely striated, horny, clouded with rufous. *Sculpture:* The protoconch is microscopically radially finely striate; on the following whorls the riblets are stronger and more distant, about 10 per millimetre, protractive at the suture, slightly flexuous on the periphery and base; interstices with fine growth-lines, decussated by microscopic spiral liræ, present on all whorls. *Colour* pale-horny with fulvous irregular streaks and zigzag lines, more crowded and sometimes tessellating on the base. *Epidermis* thin, diaphanous, very slightly shining. *Spire* little raised, very slightly convex. *Protoconch* of 1½ convex turns. *Whorls* 5, rather convex, slowly increasing, periphery and base rounded. *Suture* impressed. *Aperture* subvertical, rotundly lunate. *Peristome* simple sharp, retracting and forming a distinct sinus at the suture, margins converging. *Columella* short, arcuate. The *inner lip* not reflexed; parietal wall with a very thin shining callosity. *Umbilicus* wide, perspective, about one-third of the greater diameter.

Diameter, 3 mm.; height, 1·3 mm.

Dentition—Suter, T.N.Z.I., xxiv, 293, pl. 21, f. 24, 25; Man. Conch. (2), ix, pl. 9, f. 20, 21.

Jaw thin, slightly arcuate, not tapering, with strong vertical distant striæ.

Radula with the formula 80 × 9+5+1+5+9. Central tooth tricuspid, the median cusp long. First laterals similar, the outer ones with a longer mesocone, and the entocone larger than the ectocone. Marginals with 3 to 4 cutting-points.

Type in the British Museum.

Hab.—North Island: Whangarei; Wade; Mount Wellington lava-fields; Howick; Tuakau; Hunua Range; Mount Pirongia; Toko, near Stratford; Otaki Gorge; Ngaputahi, Tuhoe-land; Ormondville; Forty-mile Bush; Paekakariki; Thames; Hawke's Bay; Ohaupo. South Island: Kenepuru; Akaroa; Dyer's Pass, Lyttelton; Riccarton Bush; Bealey; Oxford; Greymouth.

Forma albina.

A perfectly white specimen from the Hunua Range, found by Major T. Broun, is in my collection.

Subsp. serpentinula, Suter, 1891.

Patula serpentinula, Sut., T.N.Z.I., xxiii, 1890 (1891), 87, pl. 16, f. 5, *a*, *b*, H. J. *P.* (*Charopa*) *serpentinula*, Sut.: Pilsbry, Man. Conch. (2), viii, 103, pl. 19, f. 34–36. *Charopa serpentinula*, Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 657. *Endodonta* (*Charopa*) *buccinella serpentinula*, Sut., J. de Conch., xli, 263.

Shell very small, discoidal, umbilicated. *Sculpture* consisting of close flexuous radial riblets, about 15 per millimetre, much finer and closer together on the protoconch; interstices with fine growth-lines, the microscopic spiral striæ almost obsolete. *Colour* pale-horny, with regular streaks and dots of rufous. *Spire* scarcely elevated, flat. *Protoconch* of $1\frac{1}{2}$ whorls. *Whorls* 5, narrow, regularly increasing, convex; periphery and base rounded. *Suture* deep. *Aperture* rotundly lunate. *Peristome* simple, straight, receding towards the suture, and forming a distinct sinus. *Umbilicus* large, perspective, slightly more than one-third of the greatest diameter.

Diameter, 2·5 mm.; height, 1·25 mm.

Jaw arcuate, faintly vertically striated, very thin.

Radula having the formula 6+5+1+5+6. Central and lateral teeth tricuspid, marginals with 3 to 4 cutting-points.

Type in my collection.

Hab.—South Island: Hooker Valley, type (H. S.); Mount Somers (W. W. Smith); St. Helens Station, Amuri (F. Suter).

Remarks.—Distinguished from the species chiefly by the smaller size, closer riblets, almost obsolete spiral lines, and a slightly wider umbilicus.

15. Endodonta caput-spinulæ, Reeve, 1852. Plate 28, figs. 6, *a*, *b*.

Helix caput-spinulæ, Rve., Conch. Icon., vii, pl. 133, f. 818. *Microphysa caput-spinulæ*, Rve.: Hutton, T.N.Z.I., xvi, 194. *Charopa caput-spinulæ*, Rve.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 659. *Endodonta* (*Charopa*) *caput-spinulæ*, Rve.: Suter, J. de Conch., xli, 266. *Helix epsilon*, Pfeiffer, M.H. Viv., iii, 97: P.Z.S., 1852 (1854), 57; Hector, Cat. Land Moll. N.Z., 11. *Patula* (*Charopa*) *epsilon*, Pfr., Nomencl. Hel. Viv., 97. *Paryphanta epsilon*, Pfr.: Hutton, M.N.Z.M., 23. *Patula* (*Microphysa*) *epsilon*, Pfr.: Tryon, Man. Conch. (2), iii, 102, pl. 20, f. 53.

Shell very small, depressed, umbilicated, thin, pale-horny, obliquely closely ribbed. *Sculpture* consisting of very thin flexuous radiate

riblets, slightly retractive toward the periphery, 10–12 per millimetre, those on the protoconch closer together; interstices with a few growth-lines, crossed by fine dense microscopic spiral lines. *Colour* pale-horny. *Spire* hardly raised, flat. *Protoconch* of $1\frac{1}{2}$ convex turns. *Whorls* $3\frac{1}{2}$ to 4, the last more rapidly increasing than the others, convex, periphery and base rounded. *Suture* impressed. *Aperture* a little oblique, rotundly lunar. *Peristome* simple, straight, margins converging. *Columella* vertical, short, arcuate. *Inner lip* not reflexed; parietal wall with a broad shining glaze. *Umbilicus* moderately wide, gradate, diameter 0·8 mm.

Diameter — Maj., 1·75 mm.; min., 1·5 mm.: height, 0·7 mm. (type, $3\frac{1}{2}$ whorls). Diameter—Maj., 2·8 mm.; min., 2·5: height, 1·3 mm. (specimen, 4 whorls).

Dentition.—Suter, T.N.Z.I., xxvi, 128, pl. 16, f. 15, 16.

Jaw membranous, distinctly vertically striated.

Radula with the formula 12 + 4 + 1 + 4 + 12. Central and lateral teeth tricuspid, with a long mesodont; marginals with 3 to 4 cutting-points.

Type in the British Museum.

Hab.—North Island: From North Cape to Wellington. South Island: Kenepuru; Stonyhurst; Kowai Bush; Riccarton Bush; Dyer's Pass; Little River; Akaroa; Mount Somers.

16. **Endodonta Colensoi**, Suter, 1890. Plate 28, figs. 7, *a*, *b*.

Patula Colensoi, Sut., T.N.Z.I., xxii, 1889 (1890), 225, pl. 14, f. 7, *a*, *b*. *P.* (*Charopa*) *Colensoi*, Sut.: Pilsbry, Man. Conch. (2), viii, 99, pl. 19, f. 16–18. *Charopa Colensoi*, Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 657. *Endodonta* (*Charopa*) *Colensoi*, Sut., J. de Conch., xli, 269.

Shell small, discoidal, umbilicate, rather solid, faintly shining, closely radially ribbed, horny with zigzag streaks of fulvous. *Sculpture* consisting of close sharp radial riblets, about 10 per millimetre, straight on the protoconch, protractive on the succeeding whorls, almost straight on the periphery and base; interstices with fine growth-lines and microscopic spiral lines passing also over the riblets. *Colour* yellowish-grey, with zigzag streaks of fulvous, sometimes flowing together. *Spire* flat. *Protoconch* of $1\frac{1}{2}$ convex turns. *Whorls* 5, slowly increasing, convex; periphery and base rounded. *Suture* deep. *Aperture* slightly oblique, roundly lunate. *Peristome* thin and sharp, retracting towards the suture, and forming a deep sinus. *Columella* vertical, arcuate. *Inner lip* very slightly thickened, not reflexed; parietal wall with a thin broad shining glaze. *Umbilicus* broad, perspective, about one-third of the greatest diameter.

Diameter—Maj., 4·2 mm.; min., 3·5 mm.: height, 2·25 mm.

Dentition.—Suter, T.N.Z.I., xxiv, 293, pl. 21, f. 26, 27.

Jaw arcuate, very thin, not tapering, distantly and faintly vertically striated.

Radula having the formula 90 × 13 + 4 + 1 + 4 + 13. Central and lateral teeth tricuspid, marginals with 3 cusps.

Type in my collection.

Hab.—North Island: Little Barrier Island (J. Adams); Auckland; Ruatahuna (E. Best); Petane (A. Hamilton); Heretaunga (Brooks); Ormondville (Chadwick); Shannon (R. Murdoch); Fortymile Bush, type (H. S.). South Island: Milford Sound (Professor Chilton).

17. Endodonta eremita, Suter, 1891. Plate 9, figs. 18, *a*, *b*.

Patula eremita, Sut., T.N.Z.I., xxiii, 1890 (1891), 87, pl. 17, f. 6, *a*, *b*. *P.* (*Charopa*) *eremita*, Sut.: Pilsbry, Man. Conch. (2), viii, 103, pl. 19, f. 37–39. *Charopa eremita*, Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 657. *Endodonta* (*Charopa*) *eremita*, Sut., J. de Conch., xli, 271.

Shell minute, subdiscoidal, umbilicated, very finely radially ribstriate, horny, silky, fragile, pellucid. *Sculpture* consisting of fine and close radiate riblets, 28 to 30 per millimetre, those on the post-nuclear whorls slightly protractive above, straight and somewhat flexuous on the periphery and base; interstices microscopically reticulated. *Colour* pale-horny with faint broad streaks of darker horny. *Spire* very little raised, flattish. *Protoconch* of 1½ convex whorls. *Whorls* 4, narrowly rolled up, regularly increasing, convex; base rounded. *Suture* deep. *Aperture* subvertical, rotundly lunate. *Peristome* acute, nearly straight, somewhat retracted at the suture, regularly arched, margins convergent. *Columella* short, arcuate. *Inner lip* not reflected. Parietal wall with a thin shining glaze. *Umbilicus* wide and deep, showing the nucleus, gradate, about one-third of the greatest diameter.

Diameter, 2 mm.; height, 0·75 mm.

Animal unknown.

Type in my collection.

Hab.—South Island: White Horse Hill, Hooker Valley; one specimen (H. S.).

Remarks.—This species represents a middle form between *E. infecta* and *E. corniculum*.

18. Endodonta infecta, Reeve, 1852. Plate 28, figs. 8, *a*, *b*.

Helix infecta, Reeve, Conch. Icon., vii, pl. 132, f. 808. *Patula infecta*, Rve.: Hutton, T.N.Z.I., xvi, 193. *Charopa infecta*, Rve.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 657. *Endodonta* (*Charopa*) *infecta*, Rve.: Suter, J. de Conch., xli, 265. *Helix zeta*, Pfeiffer, M.H. Viv., iii, 1853, 109; P.Z.S., 1852 (1854), 58; Conch. Cab. (2), i, 459, pl. 155, f. 27–30; Hector, Cat. Land Moll. N.Z., 14. *Patula* (*Charopa*) *zeta*, Pfr., Nomencl. Hel. Viv., 98. *P. zeta*, Pfr.: Hutton, M.N.Z.M., 9. *Helix* (*Patula*) *zeta*, Pfr.: Tryon, Man. Conch. (2), iii, 23, pl. 3, f. 14.

Shell very small, depressed, discoidal, widely umbilicated, rather solid, closely ribbed, yellowish with chestnut spots. *Sculpture*

Protoconch with fine and close straight radial striæ, the post-nuclear whorls with more distant obliquely advancing riblets, acutely arcuated above the periphery, thence slightly flexuous, straight on the base, about 10 per millimetre; the riblets are equal, equidistant, not very high, rounded, the interstices with fine growth-lines, and the whole shell ornamented with exceedingly fine microscopic spiral striæ. *Colour* pale-yellowish, tessellated with large chestnut spots. *Spire* flat, very lightly submersed in the middle. *Protoconch* of 1½ convex turns. *Whorls* 5½, very narrow, convex, the last whorl somewhat tapering and flattish at the periphery, but widened and becoming somewhat higher on approaching the aperture; base convex. *Suture* deep. *Aperture* a little oblique, smallish, lunately circular. *Peristome* simple, sharp, retracting and forming a sinus at the suture, margins converging. *Columella* short, vertical, arcuate. *Inner lip* strengthened by a moderate callus, not reflexed; parietal wall with a thin shining glaze. *Umbilicus* wide, perspective, its diameter 1·4 mm.

Diameter—Maj., 3·7 mm.; min., 3·3 mm.: height, 1·5 mm.

Animal and Dentition.—Hutton, T.N.Z.I., xvi, 164, pl. 9, f. H.

Animal like that of *E. coma*. White; eye-peduncles and a stripe on each side of the head greyish.

Jaw finely vertically striated.

Radula having the formula 12 + 3 + 1 + 3 + 12. Central and first lateral teeth tricuspid, with a long mesocone, the other laterals smaller, the ectocone obsolete; marginals tridentate, the denticles nearly equal in size.

Type in the British Museum.

Hab.—North Island: Waimarama (A. Hamilton); Whangarei; Petane; Heretaunga; Hunterville; Mount Egmont, 3,000 ft. to 4,500 ft.; Shannon (R. Murdoch). South Island: Birch Hill, Nelson (E. Suter); Greymouth; Bealey (v. Haast); Oxford (Professor Chilton).

19. **Endodonta irregularis**, Suter, 1890. Plate 28, figs. 9, *a*, *b*.

Patula infecta, Reeve, var. *irregularis*, Sut., T.N.Z.I., xxii, 1889 (1890), 224, pl. 14, f. 6, *a*, *b*. *P.* (*Charopa*) *zeta*, Pfr., var. *irregularis*, Sut.: Pilsbry, Man. Conch. (2), viii, 98, pl. 19, f. 13–15. *Charopa infecta*, Rve., var. *irregularis*, Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 658. *Endodonta* (*Charopa*) *infecta irregularis*, Sut., J. de Conch., xli. 265.

Shell very small, subdiscoidal, umbilicated, yellowish-white with brown streaks, slightly shining, thin. *Sculpture:* Protoconch with fine and close radiate striæ, the following whorls more distantly radially ribbed, the ribs somewhat irregularly developed, and inequidistant below the suture; there are 12 to 13 per millimetre; they are obliquely directed forward above the periphery, then arcuate and descending almost straight over the periphery to the base; interstices with fine growth-lines, more or less distinctly reticulated by microscopic spiral liræ. *Colour* yellowish-white with distant straight or zigzag streaks.

sometimes vanishing on the base. *Spire* very little elevated, broadly convex. *Protoconch* of 1½ convex volutions. *Whorls* 5, slowly increasing, convex, periphery and base rounded. *Suture* not deep. *Aperture* rotundly lunate, slightly oblique. *Peristome* acute, thin, retracting on the suture and forming a distinct sinus. *Columella* vertical, short, arcuate. *Inner lip* slightly thickened, not reflexed; parietal wall with a thin shining glaze. *Umbilicus* wide, about one-third of the greatest diameter, deep, showing all the whorls.

Diameter—Maj., 3 mm.; min., 2·6 mm.: height, 1·5 mm.

Animal unknown.

Type in my collection.

Hab.—North Island: Auckland; Forty-mile Bush, type (H. S.). South Island: Kenepuru (McMahon). Under rotten logs and dead leaves; rare.

20. **Endodonta mutabilis**, Suter, 1891. Plate 9, figs. 19, *a*, *b*.

Patula mutabilis, Sut., T.N.Z.I., xxiii, 1890 (1891), 84, pl. 16, f. 2, *a*, *b*. B, C. *P.* (*Charopa*) *mutabilis*, Sut.: Filsbry, Man. Conch. (2), viii, 101, pl. 19, f. 25–27. *Charopa mutabilis*, Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 656. *Endodonta* (*Charopa*) *tau*, Pfr., J. de Conch., xli, 267. *Charopa tau*, Pfr.: Suter, P.L.S. N.S.W. (2), viii, 499; not of Pfeiffer. *Endodonta* (*Charopa*) *mutabilis*, Sut.: Murdoch, P. Mal. S., iii, 322.

Shell very small, subdiscoidal, umbilicated, finely and distantly costate, horny with brown streaks. *Sculpture:* Protoconch finely and closely radially striate, the following whorls with distant very thin and sharp riblets, 6 to 8 per millimetre, acutely protractive on the upper surface, arcuate toward the periphery, on which and on the base they are almost straight, slightly flexuous; interstices with numerous fine growth-lines and indistinct dense microscopic striæ. absent on the protoconch. *Colour* horny with irregular light-brown blotches, forming zigzag lines on the periphery, and vanishing upon the base. *Spire* slightly elevated, flat. *Protoconch* of 1½ convex whorls. *Whorls* 5, convex, slowly but regularly increasing, the last slightly descending; periphery and base convex. *Suture* deep. *Aperture* oblique, lunate. *Peristome* thin and sharp, retractive toward the suture, where it forms a deep and narrow sinus. *Columella* vertical, short, arcuate. *Inner lip* not reflexed, slightly callous; parietal wall with a thin shining callous layer. *Umbilicus* wide and deep, showing the nucleus distinctly, about one-third of the greater diameter.

Diameter—Maj., 3 mm.; min., 2·6 mm.: height, 1·5 mm.

Jaw finely vertically striated, arcuate, not tapering at the ends, with a slight median projection.

Radula having the formula 16 + 1 + 16; laterals about 7. Central tooth tricuspid, with a long mesodont; laterals very similar to the central tooth; marginals with 3 to 4 cutting-points.

Type in my collection.

Hab.—South Island: Stonyhurst (F. Suter); Mount Somers (W. W. Smith); Hooker Valley, type (H. S.); Dunedin (H. S.); Castle Rock, Southland (A. Hamilton). Under rotten wood, dead leaves, and amongst mould; rare.

Forma albina.

Perfectly white specimens occur together with the brown-streaked form, and seem to be more abundant.

21. Endodonta otagoensis, Suter, 1899. Plate 28, figs. 10, *a*, *b*.

Endodonta (*Charopa*) *otagoensis*, Suter, P. Mal. S., iii, 286, pl. 15, f. 1.

Shell small, discoidal, broadly umbilicated, fragile, semitransparent, ribbed, not shining. *Sculpture:* Protoconch finely radially striate, succeeding whorls with close equidistant rounded oblique riblets, protractive near the suture, sinuous on the periphery, about 11 per millimetre; interstices with fine growth-lines and indistinct microscopic spiral lines. *Colour* yellowish-white with irregular reddish-brown streaks. *Spire* flat. *Protoconch* of 1½ convex volutions. *Whorls* 5, the first three very slowly, the others more rapidly increasing, convex; periphery and base rounded. *Suture* deep. *Aperture* oblique, rotundly lunate, extremities converging. *Peristome* thin, upper margin retractive at the suture, leaving a narrow sinus, rapidly advancing, then turning down with a slight concave sinuation. *Columella* vertical, arcuate. *Inner lip* callous, very little expanded; parietal wall with a thin, white and shining, broadly expanded callosity. *Umbilicus* broad, perspective, about one-third of the greatest diameter.

Diameter—Maj., 6 mm.; min., 5·25 mm.: height, 2·5 mm.

Animal unknown.

Type in my collection.

Hab.—Dunedin, in native bush, under pieces of rotten wood (H. S.).

22. Endodonta reeftonensis, Suter, 1892. Plate 28, figs. 11, *a*, *b*.

Patula Sterkiana, Sut., var. *reeftonensis*, Sut., T.N.Z.I., xxiv, 1891 (1892), 294. *P.* (*Charopa*) *Sterkiana reeftonensis*, Sut.: Pilsbry, Man. Conch. (2), viii, 102. *Charopa Sterkiana reeftonensis*, Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 656. *Endodonta* (*Charopa*) *Sterkiana reeftonensis*, Sut., J. de Conch., xli, 270.

Shell very small, subdiscoidal, umbilicated, closely ribbed, thin and fragile. *Sculpture:* Protoconch with fine and close radial striæ, the following whorls finely radially ribbed, the riblets thin and equidistant, protractive on the upper surface, slightly flexuous on the periphery, straight on the base, about 15 per millimetre; interstices with fine growth-lines, decussated by microscopic fine spirals, not visible on the protoconch. *Colour* horny with oblique unequal fulvous

streaks. *Spire* very little raised, flattish or broadly convex. *Protoconch* of 1½ convex volutions. *Whorls* 5, convex, slowly increasing, periphery and base rounded. *Suture* impressed. *Aperture* somewhat oblique, lunate. *Peristome* thin and sharp, retractive toward the suture, where it forms a not very deep sinus. *Columella* short, vertical, arcuate. *Inner lip* not thickened and not reflexed; parietal wall with a thin broad and shining glaze. *Umbilicus* rather broad, deep, the nucleus distinctly visible, about one-third of the greatest diameter.

Diameter—Maj., 2·7 mm.; min., 2·2 mm.: height, 1·75 mm.

Jaw and *radula* normal. Formula of teeth of radula 12 + 4 + 1 + 4 + 12.

Type in my collection.

Hab.—South Island: Capleston, near Reefton, type (Cavell). Stewart Island: Half-moon Bay (A. Hamilton).

Remarks.—In Stewart Island specimens the last whorl is slowly descending, the spire therefore slightly higher.

23. **Endodonta Roseveari,** Suter, 1896. Plate 10, figs. 5, 5*a*, 5*b*.

Endodonta (*Charopa*) *Roseveari*, Suter, P. Mal. S., ii, 1896, 34, pl. 4, f. 5–7.

Shell small, subdiscoidal, umbilicated, finely ribbed, horny with brown streaks, dull, thin, semitransparent. *Sculpture:* Protoconch with fine radiate striæ, no spirals; the post-nuclear whorls with fine sharply elevated riblets, about 10 per millimetre, acutely protractive on the upper surface, sinuate on the periphery; the interstices minutely decussate. *Colour* horny, with radiate rufous streaks, which are irregularly disposed on the upper surface, form zigzag lines on the periphery, and are obscurely tessellated on the base. *Spire* flatly depressed. *Protoconch* obtuse, of 1½ convex turns. *Whorls* 5, convex, slowly and regularly increasing; periphery and base rounded. *Suture* impressed. *Aperture* lunate, oblique. *Peristome* acute, regularly arched, retractive toward the suture, and forming a rather deep sinus, with a broad concave sinuosity at the periphery. *Columella* short, arcuate. *Inner lip* somewhat callous, not reflexed; parietal wall with a broad thin and shining glaze. *Umbilicus* moderately wide, nearly a quarter of the greatest diameter, showing all the whorls and the nucleus.

Diameter—Maj., 4 mm.; min., 3·5 mm.: height, 2 mm.

Animal unknown.

Type in my collection.

Hab.—North Island: Hokianga; Waiheke Island (H. S.); Titirangi (H. S.); Ohaupo (Musson); Tarukenga, near Rotorua, type (Major Broun); Ruatahuna (E. Best); Toko, near Stratford (R. Murdoch).

Remarks.—The specimen from Titirangi has the riblets a little farther apart, 8 per millimetre.

24. Endodonta Sterkiana, Suter, 1891. Plate 9, figs. 20, *a*, *b*.

Patula Sterkiana, Sut., T.N.Z.I., xxiii, 1890 (1891), 85, pl. 16, f. 3, *a*, *b*, D, E. *P.* (*Charopa*) *Sterkiana*, Sut.: Pilsbry, Man. Conch. (2), viii, 101, pl. 19, f. 28–30. *Charopa Sterkiana*, Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 656. *Endodonta* (*Charopa*) *Sterkiana*, Sut., J. de Conch., xli, 270.

Shell small, subdiscoidal, umbilicated, yellowish-grey, with faint fulvous markings, very finely and closely radially ribbed, not shining, rather solid, semitransparent. *Sculpture:* Protoconch with very fine radiate striæ, which on the following whorls are becoming very oblique and a little more distant, protractive on the upper surface, almost straight but flexuous on the periphery and base, 20 to 24 per millimetre; the interstices with a few growth-lines and microscopic dense spiral lines passing over the riblets. *Colour* yellowish-grey with very irregular light-brown streaks and dots, sometimes tessellated or forming zigzag lines. *Spire* but little elevated, flattish. *Protoconch* of $1\frac{1}{2}$ convex turns. *Whorls* 5, slowly increasing, convex, the last slightly descending, periphery and base rounded. *Suture* well impressed. *Aperture* oblique, rotundly lunate. *Peristome* thin and sharp, retracting at the suture, and forming a rather deep sinus. *Columella* vertical, arcuate, short. *Inner lip* somewhat callous, not reflexed; parietal wall with a thin shining broad callosity. *Umbilicus* moderate, deep, showing all the whorls and the nucleus, about one-fourth of the greatest diameter.

Diameter—Maj., 3·8 mm.; min., 3·5 mm.: height, 2 mm.

Jaw arcuate, not tapering, finely vertically striated, with a slight median projection.

Radula having the formula 12+4+1+4+12. Central tooth tricuspid, the mesocone reaching to the posterior margin of the base. Laterals much like the central. Marginal teeth with 3 cutting-points, the ectocone shorter.

Type in my collection.

Hab.—South Island: Birch Hill Station, Nelson (E. Suter); White Horse Hill, Hooker Valley, type (H. S.).

Forma major, Suter, 1892.

Patula Sterkiana, forma *major*, Sut., T.N.Z.I., xxiv, 1891 (1892), 295.

The shell differs from the species only in its larger size, and an occasional additional half-volution. Specimens from Queenstown have only 14 riblets per millimetre, but otherwise there is no difference from the type.

Diameter—Maj., 4·5 mm.; min., 4 mm.: height, 2·5 mm.

Type in my collection.

Hab.—South Island: Owaka, type (J. T. Bryant); The Nuggets, Port Molyneux (A. Hamilton); Queenstown (Captain Hutton); Fortrose (Miss Rich).

25. Endodonta subinfecta, Suter, 1899. Plate 28, figs. 12, *a*, *b*.

Endodonta (*Charopa*) *subinfecta*, Suter, P. Mal. S., iii, 1899, 286, pl. 15, f. 2.

Shell very small, subdiscoidal, broadly umbilicated, thin, semi-transparent, ribbed, not shining, horny with rufous patches. *Sculpture:* Protoconch with fine radiate striæ; the following whorls with equidistant, oblique, sharp, and rather elevated riblets, protractive near the suture, acutely arcuate toward the periphery, whence they descend flexuously to the base, about 8 per millimetre; the interstices microscopically decussate. *Colour* yellowish-white, with rufous patches above, but forming indistinct zigzag bands toward the base. *Spire* almost flat. *Protoconch* white, of 1½ convex turns. *Whorls* 5, the first three very narrow, the others more rapidly increasing, convex, the last very lightly descending in front; periphery and base rounded. *Suture* deep. *Aperture* oblique, rotundly lunate. *Peristome* thin, sharp, extremities converging, the upper lip slightly advancing and leaving a distinct infrasutural sinus. *Columella* arcuate, vertical, short. *Inner lip* slightly callous and expanded; parietal wall with a broad thin shining glaze. *Umbilicus* broad and perspective, about one-third of the greatest diameter.

Diameter, 3 mm.; height, 1·5 mm. Diameter of umbilicus, 1·1 mm.

Animal unknown.

Type in my collection.

Hab. — South Island: Kenepuru (McMahon); Stonyhurst (F. Suter); Riccarton Bush, type (H. S.); Little River (H. S.).

26. Endodonta tapirina, Hutton, 1883. Plate 28, figs. 13, *a*, *b*.

Patula tapirina, Hutt., T.N.Z.I., xv, 1882 (1883), 134; xvi, 193: Tryon, Man. Conch. (2), iii, 23; viii, 97; ix, pl. 6, f. 63–65. *Charopa tapirina*, Hutt.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 656. *Endodonta* (*Charopa*) *tapirina*, Hutt.: Suter, J. de Conch., xli, 268. *Patula coma*, Gray: Hutton, T.N.Z.I., xiv, 150; not of Gray.

Shell small, subdiscoidal, broadly umbilicated, closely ribbed, the riblets of unequal elevation, thin but fairly solid, the riblets shining. *Sculpture:* Protoconch either smooth (Otago specimens), or finely radiately striate, which occurs in most specimens that came under my observation; the following whorls with narrow oblique riblets, about 8 per millimetre; they are protractive above, arcuate toward the periphery, thence straight, but somewhat flexuous; 2 to 4 lower riblets are usually followed by a higher one; interstices with a few growth-lines, but no spiral sculpture. *Colour* horny-brown, subradiated with reddish-brown, or yellowish-brown with faint radial darker streaks. *Spire* very slightly elevated, mostly quite flat. *Protoconch* of 1½ convex volutions. *Whorls* 5, slowly increasing, rounded, periphery and base convex. *Suture* well impressed. *Aperture* subvertical, rotundly lunate. *Peristome* thin and sharp, upper margin rapidly advancing, leaving a distinct sinus at the suture, then turning

down with a slightly concave sinuation, then regularly arched. *Columella* short, arcuate. *Inner lip* slightly thickened, not reflexed; parietal wall with a shining thin glaze. *Umbilicus* moderately wide, deep, showing all the whorls, about one-third of the greatest diameter.

Diameter—Maj., 4·75 mm.; min., 4·2 mm.: height, 2·75 mm.

Dentition.—Hutton, T.N.Z.I., xiv, 150, pl. 3, f. A, L; pl. 4, f. G; *l.c.*, xvi, 165, pl. 9, f. G.

Animal like *E. coma;* colour white; eye-peduncles, tentacles, and a stripe down each side of the head purplish-black.

Jaw slightly arcuate, with the ends attenuated, distantly vertically striate.

Radula having the formula 13+1+13; about 6 laterals. Marginals with 3 and 2 cutting-points.

Type in the Canterbury Museum, Christchurch.

Hab.—North Island: Wade; Auckland; Thames; Hunua Range; Maketu; Tuhoe-land; Heretaunga; Dannevirke; Toko, near Stratford; Wanganui; Shannon; Forty-mile Bush. South Island: Kenepuru; Lake Coleridge; Dunedin (type); Taieri; Owaka; Fortrose; Preservation Inlet. Stewart Island: Half-moon Bay.

Forma albina.

Perfectly white specimens are in my collection from the Forty-mile Bush, Kenepuru, and Wairoa Gorge, Nelson.

27. **Endodonta variecostata,** Suter, 1890. Plate 28, figs. 14, *a*, *b*.

Patula variecostata, Sut., T.N.Z.I., xxii, 1889 (1890), 225, pl. 14, f. 8, *a–c*. *P.* (*Charopa*) *variecostata,* Sut.: Pilsbry, Man. Conch., (2), viii, 100, pl. 19, f. 19–21. *Charopa variecostata,* Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 657. *Endodonta* (*Charopa*) *variecostata,* Sut., J. de Conch., xli, 269.

Shell minute, subdiscoidal, umbilicated, white with faint fulvous streaks, faintly shining, finely costate, semitransparent. *Sculpture:* Protoconch with very fine radiate striæ; the following whorls with more distant fine riblets, alternately one higher than the next, about 15 per millimetre, protractive on the upper surface, straight on the periphery and base; the interstices with fine growth-lines and indistinct microscopic spiral lines. *Colour* white with faint equidistant fulvous streaks. *Spire* almost flat. *Protoconch* of $1\frac{1}{2}$ convex volutions. *Whorls* $3\frac{3}{4}$, slowly and regularly increasing, convex, periphery and base rounded. *Suture* deep. *Aperture* slightly oblique, rotundly lunate. *Peristome* thin and sharp, retracted at the suture, and forming a not very deep sinus. *Columella* vertical, arcuate. *Inner lip* not reflexed. *Umbilicus* broad, perspective, about one-third of the greatest diameter.

Diameter, 1·8 mm.; height, 1 mm.

Animal unknown.

Type in my collection.
Hab.—Mauriceville, Forty-mile Bush (H. S.).
Remark.—The only specimen I found is not quite adult.

4. *Group of* Endodonta corniculum.

Shell having nearly straight radial riblets; peristome straight; umbilicus moderately wide, more or less conical. *Protoconch spirally striate.*

Key to Species.

1. Riblets 4 per millimetre; whorls 4; dimensions, $2\frac{3}{4}$ mm. by $1\frac{1}{4}$ mm.	*segregata.*
2. Riblets 12–13 per millimetre; whorls $4\frac{1}{4}$; dimensions, 2·7 mm. by $1\frac{1}{2}$ mm.	*kenepuruensis.*
3. Riblets 24 per millimetre; whorls $4\frac{1}{2}$; dimensions, 3 mm. by $1\frac{1}{2}$ mm.	*corniculum.*
4. Riblets 35 per millimetre; whorls 4; dimensions, 2·5 mm. by $\frac{3}{4}$ mm.	*alloia.*
5. Riblets 40–45 per millimetre; whorls 4; dimensions, 2 mm. by 1 mm.	*Prestoni.*

28. Endodonta alloia, Webster, 1904. Plate 28, fig. 15.

Endodonta (*Charopa*) *alloia*, Webster, P. Mal. S., vi, 1904, 108, f. 4 in text p. 106.

Shell minute, umbilicated, subdiscoidal, finely radially rib-striate, yellowish-brown, silky. *Sculpture:* Protoconch faintly spirally striate; succeeding whorls radiately and very delicately ribbed, riblets about 35 per millimetre, almost straight, sloping slightly at suture and over periphery, backwards in the brephic stage; interstices microscopically finely reticulated. *Colour* amber to rich golden-brown, the last whorl darkest. *Spire* slightly elevated, broadly convex. *Protoconch* of $1\frac{1}{2}$ elevated whorls. *Whorls* 4, rounded, last not descending, periphery and base rounded. *Suture* deep. *Aperture* vertical, lunate. *Peristome* simple, margins converging. *Columella* nearly vertical. *Umbilicus* open, not perspective, one-fifth of the diameter.

Diameter, 2·5 mm.; height, 0·75 mm.
Animal with the foot bright yellow.
Type in Mr. Webster's collection.
Hab.—Waiuku; very scarce.

29. Endodonta corniculum, Reeve, 1852. Plate 28, figs. 16, *a*, *b*.

Helix corniculum, Rve., Conch. Icon., vii, pl. 133, f. 826. *Patula corniculum*, Rve.: Hutton, T.N.Z.I., xvi, 192. *Charopa corniculum*, Rve.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 655. *Endodonta* (*Charopa*) *corniculum* Rve.: Suter, J. de Conch., xli, 264. *Helix eta*, Pfeiffer, M.H. Viv., iii, 1853, 107; P.Z.S., 1852 (1854), 57; Hector, Cat. Land Moll. N.Z., 14; Man. Conch. (2), iii, 24, pl. 3, f. 12. *Patula eta*, Pfr., Nomencl. Hel. Viv., 98; Hutton, M.N.Z.M., 9.

Shell very small, subdiscoidal, umbilicated, very finely radially striated, silky, waxen. *Sculpture* of the protoconch formed by dis-

tinct spiral striæ, about 8; succeeding whorls with very fine close flexuous and slightly protractive riblets, about 24 per millimetre; interstices with a few growth-lines, which, as well as the riblets, are crossed by distinct very close microscopic striæ. *Colour* horny. *Spire* flattish. *Protoconch* of $1\frac{1}{2}$ convex turns. *Whorls* 4 to $4\frac{1}{2}$, convex, regularly increasing, but the last proportionally broad, periphery and base rounded. *Suture* deep. *Aperture* a little oblique, lunately subcircular. *Peristome* simple, straight. *Columella* vertical, arcuate. *Inner lip* not thickened and not reflexed; parietal wall with a broad shining white glaze. *Umbilicus* moderately broad, deep, conical, showing the protoconch, about a quarter of the greatest diameter.

Diameter—Maj., 3 mm.; min., 2·7 mm.: height, 1·5 mm.

Animal and Dentition.—Hutton, T.N.Z.I., xvi, 164, pl. 9, f. F.

Animal like *E. coma*, but the eye-peduncles smaller and not clavate; white, slightly speckled with grey above; peduncles purplish.

Jaw finely vertically striated.

Radula having the formula $14 + 1 + 14$; laterals 4 or 5. Central and lateral teeth tricuspid, the mesodont as long as the base; marginals with 3 acute points.

Type in the British Museum.

Hab.—North Island: Tom Bowline's Bay (C. Cooper); Whangarei (Musson); Waiwera (H. S.); Waitakerei Range (H. S.); Auckland (Gillies); Thames (Adams); Howick; Hunua Range (Major Broun); Ohaupo (Musson); Waimarama; Gisborne (A. Hamilton); Dannevirke (Brooks); Otaki Gorge (Preston); Ngaputahi, Tuhoe-land (A. Hamilton); Forty-mile Bush (H. S.).

This is a rather rare shell.

Forma albina.

Two snow-white specimens from the Mount Wellington lava-fields are in my collection. (H. S.)

Var. maculata, Suter, 1891.

Patula corniculum, Reeve, var. *maculata*, Sut., T.N.Z.I., xxiii, 1890 (1891), 89. *P. eta*, Pfr., var. *maculata*, Sut.: Pilsbry, Man. Conch. (2), viii, 96. *Charopa corniculum maculata*, Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 655. *Endodonta* (*Charopa*) *corniculum maculata*, Sut., J. de Conch., xli, 265.

Shell somewhat smaller than the species; the riblets number 20 to 22 per millimetre. The microscopic *sculpture* is the same. *Colour* white, with rufous radiate streaks at very irregular distances. The last *whorl* is not so broad in proportion to the others, and the *suture* is not so deep.

Diameter, 2·75 mm.; height, 1·5 mm.

Animal unknown.

Type in my collection.

Hab.—North Island: Waitakerei Range; Auckland (H. S.); Motutapu Island (A. Suter); Hunua Range (Major Broun); Ohaupo (Musson); Ruatahuna (E. Best); Seventy-mile Bush; near Waitomo Caves (A. Hamilton); Otaki Gorge; near Wellington. South Island: Mount Somers (W. W. Smith); Hooker Valley, type (H. S.); Akaroa (F. Suter).

30. **Endodonta kenepuruensis,** Suter, 1909. Plate 28, figs. 17, *a*, *b*.

Endodonta (*Charopa*) *kenepuruensis*, Sut., P. Mal. S., viii, 1909, 260, pl. 11, f. 23.

Shell very small, subdiscoidal, moderately umbilicated, radially finely ribbed, thin and fragile. *Sculpture* of protoconch consisting of about 8 fine somewhat inequidistant spiral liræ; the succeeding whorls have fine, not very close, flexuous radial riblets, about 12-13 per millimetre; the interspaces microscopically exceedingly finely reticulated by growth-lines and spiral striæ, the latter being much finer and closer together than on the protoconch. *Colour* white, with a few distant light-brown streaks. *Epidermis* thin, not shining. *Spire* flattish, very little elevated. *Protoconch* of $1\frac{1}{2}$ convex volutions. *Whorls* $4\frac{1}{4}$, regularly increasing, periphery and base rounded. *Suture* deep. *Aperture* oblique, lunate. *Peristome* thin and sharp, regularly arched. *Columella* short, vertical, arcuate. *Inner lip* slightly expanded, and forming a thin callous layer on the parietal wall. *Umbilicus* moderate, its diameter 0·7 mm., deep and subcylindrical.

Diameter.—Maj., 2·7 mm.; min., 2·5 mm.; height, 1·5 mm.

Animal unknown.

Type in my collection.

Hab.—South Island: Kenepuru; one specimen (McMahon).

31. **Endodonta Prestoni,** Sykes, 1895. Plate 28, fig. 19.

Endodonta (*Charopa*) *Prestoni*, Sykes, P. Mal. S., i, 1895, 218, figs. in text.

Shell minute, depressed, deeply umbilicated, finely costulate, whitish, thin and fragile. *Sculpture:* Protoconch with distant spiral striæ; the following whorls are finely and closely radially costate, 40 to 45 per millimetre, the riblets are fine and flexuous; interstices with growth-lines and microscopic spiral liræ; looking into the umbilicus we see spiral striæ, which continue up to the mouth, and appear to correspond to the apical striæ seen from above. *Spire* little elevated or quite flat. *Protoconch* of $1\frac{1}{2}$ convex turns. *Whorls* 4, slowly increasing, convex, periphery and base rounded. *Suture* impressed. *Aperture* rotundly lunate. *Peristome* simple, straight. *Columella* short, arcuate, not reflexed above. *Umbilicus* moderately wide, deep, subcylindrical, showing the nucleus, about a quarter of the greatest diameter.

Diameter, 2 mm.; height, 1 mm.

Animal unknown.

Type in Mr. Sykes's collection.

Hab.—North Island : Otaki Gorge, type (H. B. Preston) ; Ormondville (Chadwick) ; Forty-mile Bush (H. S.).

Remarks.—Nearly allied to *E. corniculum* and *E. Bianca*, but at once distinguished from both by the excessively fine and dense riblets.

32. Endodonta segregata, Suter, 1894. Plate 28, figs. 18, *a*, *b*.

Charopa segregata, Sut., P.L.S. N.S.W. (2), viii, 496, pl. 23, f. 10, *a*, *b*. *Endodonta* (*Charopa*) *segregata*, Suter, J. de Conch., xli, 271.

Shell small, discoidal, umbilicated, not shining, rather distantly radially ribbed, thin, semitransparent. *Sculpture* of the post-nuclear whorls consisting of almost straight subequidistant sharp radial riblets, 4 per millimetre ; all the whorls are microscopically finely spirally striate ; the interstices between the riblets with fine growth-lines, decussated by the spirals. *Colour* horny, with distant irregular light-brown radiate streaks. *Spire* but little elevated, flattish. *Protoconch* of 1½ shining and convex volutions. *Whorls* 4, slowly and regularly increasing, convex, periphery and base rounded. *Suture* deep. *Aperture* slightly oblique, rotundly lunate. *Peristome* simple, acute, straight, regularly curved. *Columella* short, vertical, arcuate. *Inner lip* very slightly expanded, not callous, extending as a thin shining layer over the parietal wall. *Umbilicus* moderately wide, conical, about one-third of the diameter.

Diameter—Maj., 2·75 mm. ; min., 2·5 mm. : height, 1·25 mm.

Animal unknown.

Type in my collection.

Hab.—North Island : Waimarama ; found amongst a lot of other shells from flood-margin of a stream (A. Hamilton).

5. *Group of* Endodonta biconcava.

Shell discoidal, spire concave or infundibular. Protoconch radiately striate, smooth or spirally lirate.

Key to Species.

A. Protoconch radiately striate. Riblets 10 per millimetre ; interstices without spiral striation ; spire moderately concave ; whorls 5 ; dimensions, 5 mm. by 2 mm. .. .. *biconcava.*

B. Protoconch spirally lirate. Riblets 19 per millimetre ; interstices without spiral striæ ; spire infundibular, sunk to one-third of height ; whorls 5 ; dimensions, 1·6 mm. by ¾ mm. *vortex.*

C. Protoconch smooth.

1. Riblets 7–9 per millimetre ; interstices with indistinct spiral lines ; spire concave, sunk to one-quarter of height ; whorls 4 ; dimensions, 4 mm. by 2 mm. .. *Moussoni.*

2. Riblets 15 per millimetre ; interstices reticulated ; spire deeply concave ; whorls 4 ; dimensions, 2·7 mm. by 1½ mm. .. .. *Huttoni.*

3. Riblets 20 per millimetre ; interstices with very fine dense spiral striæ ; whorls 5 ; dimensions, 1·9 mm. by 1·1 mm. .. .. *microrhina.*

4. Riblets 30 per millimetre ; interstices without spirals ; spire infundibular, deep ; whorls 5 ; dimensions, 1¼ mm. by 0·8 mm. .. .. *subantialba.*

33. Endodonta biconcava, Pfeiffer. 1853. Plate 28, figs. 20, *a*, *b*.

Helix biconcava, Pfr., M.H. Viv., iii, 1853, 109; P.Z.S., 1852 (1854), 149; Reeve, Conch. Icon., vii, pl. 132, f. 810; Conch. Cab. (2), i, 458, pl. 155, f. 43–47; Hector, Cat. Land Moll. N.Z., 13. *Diplomphalus biconcava*, Pfr., Nomencl. Hel. Viv., 25. *Patula biconcava*, Pfr.: Hutton, M.N.Z.M., 11; T.N.Z.I., xvi, 193. *Elæa biconcava*, Pfr.: Tryon, Man. Conch. (2), i, 130, pl. 24, f. 75. *Charopa biconcava*, Pfr.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 658. *Endodonta* (*Charopa*) *biconcava*, Pfr.: Suter, J. de Conch., xli, 266.

Shell small, discoidal with concave spire, broadly umbilicated, closely arcuately ribbed, opaque, horny with light-brown streaks, a distinct sinus at the suture. *Sculpture* consisting of oblique radial riblets, fine and close together on the protoconch, about 10 per millimetre at the periphery; they are distinctly protractive above, arcuate on reaching the periphery, thence flexuous and gently directed backwards; interstices with a few growth-lines, no spirals. *Colour* horny-yellowish, rufously streaked. *Spire* concave. *Protoconch* of $1\frac{1}{2}$ convex turns. *Whorls* 5, the first four slowly increasing, distinctly angled above, periphery and base rounded. *Suture* well impressed. *Aperture* subvertical, higher than broad, lunate. *Peristome* simple, sharp, retracting at the suture and forming a conspicuous sinus. *Columella* short, arcuate. *Inner lip* slightly expanded; parietal wall with a broad shining whitish glaze. *Umbilicus* broad, perspective.

Diameter—Maj., 5 mm.; min., 4·3 mm.: height, 2 mm.

Dentition.—Suter, T.N.Z.I., xxiv, 295, pl. 22, f. 30, 31.

Jaw slightly arcuate, membranous, vertically striated.

Radula having the formula $120 \times 14 + 5 + 1 + 5 + 14$. Central and lateral teeth tricuspid, with long mesodonts. Marginals tridentate, the mesodont longest, teeth mostly curved.

Type in the British Museum.

Hab.—North Island: Thames (Adams); Heretaunga (Brooks); Forty-mile Bush; Wellington (H. S.).

Forma minor, Suter.

Distinguished from the species by its smaller size only; the number of riblets is the same; whorls also 5.

Diameter—Maj., 4 mm.; min., 3·5 mm.: height, 1·75 mm.

Type in my collection.

Hab.—Dunedin, type (H. S.); Fortrose (Miss Rich).

34. Endodonta Huttoni, Suter, 1890. Plate 29, figs. 1, *a*, *b*.

Diplomphalus Huttoni, Sut., T.N.Z.I., xxii, 1889 (1890), 226, pl. 15, f. 11, *a*, *b*. *Patula Huttoni*, Sut., T.N.Z.I., xxiv, 273. *P.* (*Charopa*) *Huttoni*, Sut.: Pilsbry, Man. Conch. (2), viii, 104, pl. 19, f. 43–45. *Charopa Huttoni*, Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 659. *Endodonta* (*Charopa*) *Huttoni*, Sut., J. de Conch., xli, 270.

Shell small, discoidal with sunken spire, umbilicated, radially delicately costate, thin and fragile, translucent, light horn-colour.

Sculpture of the post-embryonic whorls formed by fine sharp and equidistant riblets, about 15 per millimetre; they are protractive above, arcuate on reaching the periphery; interstices with microscopic growth-lines reticulated by spiral liræ. *Colour* light-horny, with very faint broad radial streaks of darker horny. *Spire* deeply concave, sunk to about one-third the height of the shell. *Protoconch* smooth and shining, of 1½ convex turns. *Whorls* 4, convex, the inner ones narrowly rolled up, the last largely developed, occupying about two-thirds of the diameter of the shell, the inner side very rapidly ascending and angled above; periphery and base rounded. *Suture* canaliculate. *Aperture* lunate, rather narrow, vertical. *Peristome* straight, acute, upper margin narrowly arcuate. *Columella* short, arcuate. *Inner lip* not thickened and not reflexed; parietal wall with a broad white and thin callus. *Umbilicus* moderately broad, deep, perspective, its diameter about one-third that of the shell.

Diameter, 2·7 mm.; height, 1·5 mm.

Animal unknown.

Type in my collection.

Hab.—North Island: Forty-mile Bush, type (H. S.); Mount Pirongia (Urquhart).

Remark.—The specimens of this very rare shell which I have do not seem to be adult.

35. Endodonta Moussoni, Suter, 1890. Plate 29, figs. 2, *a*, *b*.

Diplomphalus Moussoni, Sut., T.N.Z.I., xxii, 1889 (1890), 227, pl. 15, f. 12, *a*, *b*. *Patula Moussoni*, Sut., T.N.Z.I., xxiv, 273. *P.* (*Charopa*) *Moussoni*, Sut.: Pilsbry, Man. Conch. (2), viii, 105, pl. 19, f. 46–48. *Charopa Moussoni*, Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 658. *Endodonta* (*Charopa*) *Moussoni*, Sut., J. de Conch., xli, 270.

Shell small, discoidal with a concave spire, whitish with light-brown streaks, sharply and not very closely radially ribbed, faintly shining, thin, semitransparent. *Sculpture* consisting on the post-nuclear whorls of protractive equidistant sharp riblets, 7 to 9 per millimetre; they are arcuate toward the periphery, thence straight but slightly flexuous; interstices with numerous fine growth-lines and indistinct microscopic spiral striæ. *Colour* whitish, with light-brown streaks following the direction of the ribs. *Spire* concave, sunk to about one-quarter the height of the shell. *Protoconch* of 1½ whorls, convex and smooth, nucleus large. *Whorls* 4, the first three very narrow, the last high and broad, two-thirds of the diameter of the shell, rapidly ascending on the inner side, lightly angled above; periphery and base rounded. *Suture* canaliculate. *Aperture* lunate, higher than broad, narrow above. *Peristome* acute, simple, retracting toward the suture and slightly advancing above the periphery. *Columella* oblique, arcuate. *Inner lip* thin and sharp, not reflexed; parietal wall with a thin white callosity. *Umbilicus* moderately wide, about one-quarter of the greatest diameter, perspective.

Diameter—Maj., 4 mm. ; min., 3·4 mm. : height, 2 mm.

Animal unknown.

Type in my collection.

Hab.—North Island : Forty-mile Bush, rare, type (H. S.) ; Stratford (R. Murdoch) ; Otaki Gorge (Preston).

36. Endodonta subantialba, Suter, 1890. Plate 9, figs. 21, *a*, *b*.

Diplomphalus subantialba, Sut., T.N.Z.I., xxii, 1889 (1890), 226, pl. 15, f. 10, *a*, *b*. *Patula subantialba*, Sut., T.N.Z.I., xxiv, 273. *P.* (*Charopa*) *subantialba*, Sut. : Pilsbry, Man. Conch. (2), viii, 104, pl. 19, f. 40–42. *Charopa subantialba*, Sut. : Hedley and Suter, P.L.S. N.S.W. (2), vii, 658. *Endodonta* (*Charopa*) *subantialba*, Sut., J. de Conch, xli, 269.

Shell minute, discoidal with infundibular spire, umbilicated, light-horny, closely radially rib-striate, thin and fragile, semitransparent. *Sculpture* of the post-nuclear whorls consisting of very fine, close, subequidistant protractive riblets, about 30 per millimetre, arcuate toward the periphery, thence straight down to the umbilicus ; interstices with a few growth-lines, no spirals. *Colour* light-horny to almost white. *Spire* infundibular, deeply sunk. *Protoconch* of 1½ whorls, convex and smooth, nucleus rather large. *Whorls* 5, convex, the first three narrow and low, the fourth much raised, but the last not much higher, though becoming very broad, occupying about two-thirds of the shell's diameter ; all whorls are ascending rapidly from the suture, angled above ; periphery and base rounded. *Suture* canaliculate. *Aperture* lunate, narrow. *Peristome* acute, simple, upper margin narrowly convex. *Columella* short, arcuate. *Inner lip* sharp, not reflexed ; parietal wall with a thin white glaze. *Umbilicus* wide and deep, perspective, very similar to the sunken spire.

Diameter, 1·75 mm. ; height, 0·8 mm.

Dentition.—Suter, T.N.Z.I., xxiv, 295, pl. 22, f. 32, 33.

Jaw strongly arcuate, membranous, ends rounded, distantly vertically striated.

Radula with the formula $100 \times 7 + 4 + 1 + 4 + 7$. Central tooth tricuspid, with a short mesodont ; lateral teeth first similar to the central tooth, but the outer ones with a shorter base and longer cutting-points ; marginals tridentate, the mesodont longest.

Type in my collection.

Hab.—North Island : Forty-mile Bush, type (H. S.). South Island : Kenepuru (McMahon).

Remark.—This and the following species are allied to *E. antialba*, Beddome, from Tasmania.

37. Endodonta vortex, Murdoch, 1897. Plate 29, figs. 3, *a*, *b*.

Endodonta (*Charopa*) *vortex*, Murd., P. Mal. S., ii, 1897, 160, figs. in text.

Shell minute, discoidal, infundibular above and below, whitish with brown streaks, closely radially ribbed, somewhat shining, thin

and semitransparent. *Sculpture:* Protoconch with fine spiral lines, the following whorls closely radiately ribbed, about 19 per millimetre, directed slightly forward; interstices with 4 to 7 fine growth-lines. *Colour* whitish, with a few broad streaks of pale brown at irregular distances. *Spire* concave to about one-third of the height. *Protoconch* of $1\frac{1}{2}$ whorls, convex, with fine microscopic spiral striæ. *Whorls* 5, slowly increasing, somewhat rounded; the first three very narrow; the fourth, much larger, rising to nearly the same level as the last whorl; the last, rising abruptly from the suture, curves a little outward to its summit, from thence to the base it is regularly arcuate. *Suture* very deep. *Aperture* vertical, crescentic. *Peristome* straight, acute, margins convergent. *Columella* descending nearly vertically, more widely arcuate than the upper lip. *Inner lip* not reflexed. *Umbilicus* deep, large, nearly half the diameter, showing all the volutions.

Diameter, 1·6 mm.; height, 0·75 mm.

Animal unknown.

Type lost. *Co-type* in my collection.

Hab.—North Island: Toko, near Stratford (R. Murdoch).

Subsp. microrhina, Suter, 1909.

Endodonta (*Charopa*) *vortex microrhina*, Sut., P. Mal. S., viii, 1909, 261.

Distinguished from the species by the following characters: The shell is somewhat larger, the radial riblets less elevated and slightly closer together, about 20 per millimetre, the interstices with numerous fine microscopic growth-lines and excessively fine and dense spiral striæ. Colour white or very light horny, without any markings. Protoconch smooth, no spiral lines.

Diameter, 1·9 mm.; height, 1·1 mm., with 5 whorls.

Animal unknown.

Type in my collection.

Hab.—North Island: Near Ormondville, type (Chadwick); Mount Wellington lava-fields (Musson); Hunua Range (Major Broun).

Subfam. 2. LAOMINÆ, Suter.

Polyplacognatha, Pilsbry.

Jaw arcuate, composed of numerous separate rhomboidal plates, more or less imbricating.

Radula having a tricuspid or unicuspid central tooth, lateral and marginal teeth bicuspid.

This subfamily includes the genus *Laoma*, Gray, whose metropolis is New Zealand, but a few species are also found in Tasmania and the southern parts of Australia. It is strictly of southern distribution, and very likely originated in New Zealand. The genus *Punctum*, Morse, of the Northern Hemisphere, has a similar dentition and jaw.

Genus 1. Laoma, Gray, 1849.

Laoma, Gray, P.Z.S., 1849, 167. Type: *Bulimus?* (*Laoma*) *leimonias*, Gray. *Laoma*, Pilsbry, Man. Conch. (2), ix, 8; Proc. Acad. N.S. Phil., 1892, 403; "Nautilus," 1892, 55.

Animal heliciform, the mantle subcentral, its edge slightly reflected over the peristome; no locomotive disc nor mucous pore. Jaw arcuate, composed of 20–24 rhombic or oblong plates which are hairy-papillose and fringed at the upper and lower margins. *Radula* having the central tooth rather narrow, unicuspid or tricuspid, the mesocone much shorter than the basal plate. Lateral teeth wider, rectangular, with 2 cusps, which are either subequal or the inner one larger. Marginal teeth low, wide, with 2 short cusps, becoming obsolete on the outermost teeth. Reproductive organs simple. Shell more or less trochiform, thin, perforate or umbilicate, the periphery keeled, at least in the young; horn-coloured, mostly striped radially with tawny. Aperture rhombic, provided with entering lamellæ, or without them; lip thin, simple.

Distribution.—New Zealand, Tasmania, southern and eastern Australia, and British New Guinea.

Subgen. 1. Laoma, Gray, s. str.

Aperture provided with an entering lamella upon the columella only, or with lamellæ upon the columella, parietal wall, and outer and basal lips.

New Zealand only.

Key to Species.

A. Suture not margined.
- *a.* Shell smooth, high-conical; aperture with 3 lamellæ—1 on parietal, 1 on outer, and 1 on basal wall—and 1–2 small teeth on columella .. .. *leimonias.*
- *aa.* Shell with membranous plaits.
  - *b.* 6 plaits per millimetre, with ciliæ below suture and on keel of base; aperture with 2 lamellæ—1 on outer wall and 1 at the angle of periphery .. .. *ciliata.*
  - *bb.* 7 plaits per millimetre, without ciliæ; aperture with 4–6 lamellæ—2 on parietal wall, 2 on outer wall (usually absent in the young), and 2 on the base *pirongiaensis.*
- *aaa.* Shell with radiate fine riblets, 15 per millimetre; aperture with 6 lamellæ—2 on parietal wall, and 4 on base, far back .. .. *elegans.*

B. Suture margined above by a raised cord on the lower whorls.
- *a.* Shell finely and regularly striated; aperture with 3 to 7 lamellæ—1 on columella, 1 or 2 on parietal wall, none or 1–3 on base, 1 on outer wall .. .. .. *marina.*
- *aa.* Shell with 15 riblets per millimetre, 1 lamella on columella *pœcilosticta.*

1. Laoma ciliata, Suter, 1894. Plate 10, fig. 14.

Laoma ciliata, Suter, T.N.Z.I., xxvi, 1893 (1894), 136, pl. 21, f. 38, 38*a*; Suter, J. de Conch., xli, 275.

Shell minute, pupiform, perforated, horn-colour, with rather distant membranous plaits with a process below the suture, thin and

fragile, mouth with 2 lamellæ. *Sculpture* of the post-nuclear whorls consisting of distant obliquely retractive membranous plaits, about 6 per millimetre, which are produced into a tooth-shaped membrane below the suture; a second row of ciliæ is to be found on the keel of the body-whorl, but they have mostly been rubbed off; interstices with fine growth-lines. *Colour* pale-horny, without markings. *Spire* elevated, first cylindrical, then dome-shaped. *Protoconch* of 1½ smooth whorls, conic. *Whorls* 6, the first three very slowly increasing and flat, the others convex at the upper half, lightly concave below; the last keeled below; base almost flat. *Suture* not much impressed. *Aperture* transverse, squarish, with 2 lamellæ—1 slender long lamella on the middle of the outer lip and a similar one in the angle formed by the meeting of outer and basal lip. *Peristome* thin, acute, strengthened within by a white thin callus. *Outer lip* sinuate; *basal lip* slightly arched. *Columella* vertical, almost straight. *Inner lip* callous, slightly expanded, extending as a thin white callus over the flattish parietal wall. *Perforation* very narrow, open, sometimes partly hidden by the expansion of the inner lip.

Diameter, 1·75 mm.; height, 2 mm.

Jaw and *radula* very much the same as in *L. leimonias*. Formula of radula 15+1+15.

Type in my collection.

Hab.—North Island: Wade (Strickland); Kaiti, Gisborne (A. Hamilton); Toko, Stratford; Rusthall, Wanganui, type (R. Murdoch); Rissington, Hawke's Bay (Hutchinson).

2. Laoma elegans, Suter, 1896. Plate 10, figs. 7, 7*a*.

Laoma elegans, Suter, P. Mal. S., ii, 1896, 35, pl. 4, f. 11, 12.

Shell minute, conoidal, perforate, horny, without colour-markings, somewhat glossy, thin, transparent, surface radiately costate. *Sculpture* of the post-embryonic whorls formed by fine low rounded obliquely retractive riblets, about 15 per millimetre, extending on the body-whorl to the angle of the periphery, leaving the base smooth. *Colour* horny, base whitish. *Spire* dome-shaped, about 1½ times the height of the aperture. *Protoconch* of 1½ smooth and convex whorls, the nucleus large. *Whorls* 5, flatly rounded, gradually and slowly increasing, body-whorl sharply angled at the periphery; base flatly convex. *Suture* impressed. *Aperture* transverse, crescentic, with 6 long and slender lamellæ, 2 on the penultimate whorl and 4 on the base, the latter lying far back, and visible only from below through the transparent wall of the shell as white concentric lines. *Peristome* straight, acute. *Basal lip* broadly rounded. *Columella* short, slightly oblique. *Inner lip* lightly callous, reflexed. *Perforation* very narrow, pervious, open.

Diameter, 2 mm.; height, 1·5 mm.

Animal unknown.

Type in my collection.
Hab.—North Island: Whangarei.

3. Laoma leimonias, Gray, 1850. Plate 29, fig. 4.

Bulimus? (*Laoma*) *leimonias*, Gray, P.Z.S., 1849 (1850), 167. *Helix leimonias*, Gray: Pfeiffer, M.H. Viv., iii, 144; Reeve, Conch. Icon., vii, pl. 133, f. 820. *H.* (*Laoma*) *leimonias*, Gray: Hector, Cat. Land Moll. N.Z., 16. *Patula* (*Laoma*) *leimonias*, Gray, Nomencl. Hel. Viv., 97; Tryon, Man. Conch. (2), iii, 68, pl. 13, f. 55. *Endodonta leimonias*, Gray: Hutton, T.N.Z.I., xvi, 195. *Laoma leimonias*, Gray: Hutton, M.N.Z.M., 21; Hedley and Suter, P.L.S. N.S.W. (2), vii, 646; Suter, J. de Conch., xli, 274; Pilsbry, Man. Conch. (2), ix, 9, pl. 1, f. 1.

Shell very small, turretedly conical, subimperforated, rather solid, smooth, shining, pellucid, pale-horny with reddish streaks, aperture with 3 long lamellæ and 1 or 2 teeth on the columella. *Sculpture* none, except for mieroscopie fine oblique growth-lines. *Colour* pale-horny, with longitudinal fulvous streaks, which, however, are not always present. *Spire* high, turreted, rather acute. *Protoconch* of $1\frac{1}{2}$ whorls, nucleus convex, rather large. *Whorls* 7, flat, the last acutely keeled; base flat. *Suture* not deep, narrowly margined. *Aperture* subvertical, depressedly quadrangular, with 3 strong white lamellæ continued through the greater part of the whorl—1 on the parietal wall near the outer lip, 1 on the middle of the outer wall, and 1 on the base close to the peripheral angle; columella with a distinct small tooth at the middle, and very often a smaller one below. *Peristome* simple, straight. *Outer* and *basal lip* nearly straight. *Columella* subvertical, lightly arcuate. *Inner lip* with a very thin callosity, reflexed and covering the very narrow perforation; the callus is mostly of a fulvous colour.

Diameter, 2·3 mm.; height, 2·7 mm.

Dentition.—Suter, T.N.Z.I., xxvi, 129, pl. 16, f. 18; pl. 17, f. 19.

Jaw areuate, eomposed of 25 separate strongly papillate plaits.

Radula with the formula 25 + 1 + 25. Central tooth minute, narrow, unicuspid; laterals bieuspid, with triangular bases; marginals broad and and low, bieuspid.

Type in the British Museum.

Hab.—North Island: Near Auekland, type (Greenwood); Howick; Thames (Adams); Hunua Range (Major Broun); Tuakau; Ohaupo (Musson); Wairangi (A. Suter); Tarukenga (Major Broun); Mount Pirongia (Urquhart); Waimarama (A. Hamilton); Kamo (C. Cooper).

Found on *Hymenophyllum*, in dense bush (Cheeseman).

4. Laoma marina, Hutton, 1883. Plate 10, figs. 12, *a*, *c*, 12*b*.

Endodonta marina, Hutt., N.Z.J.S., i, 1883, 476; T.N.Z.I., xvi, 176, 196. *Laoma marina*, Hutt.: Suter, T.N.Z.I., xxiv, 283, fig. in text; Pilsbry, Man. Conch. (2), viii, 57, pl. 23, f. 17–20; Hedley and Suter, P.L.S. N.S.W. (2), vii, 646; Suter, J. de Conch., xli, 274, pl. 9, f. 6. *Endodonta nerissa*, Hutt., T.N.Z.I., xvi, 1883 (1884), 176, 196.

Shell very small, trochiform, carinated, narrowly perforated, thin, subtranslucent, corneous, streaked with reddish, aperture with 3 to 7

lamellæ. *Sculpture:* The protoconch is on the last half-turn microscopically spirally striated, with indications of radiate striæ; the following whorls are obliquely regularly striated, the striæ extending over the base; above the suture there is a cord-like projection. *Colour* corneous, closely striped with reddish undulating or zigzag streaks, radiating on the base, oblique above. *Spire* conic, outlines slightly convex. *Protoconch* of 1½ whorls, the nucleus smooth, convex. *Whorls* 6, flat, with the carina projecting along the suture; last whorl somewhat concave above and below the peripheral keel; base convex. *Suture* impressed, margined. *Aperture* somewhat oblique, rhombic, with 1 strong spiral fold on the columella, 1 to 2 strong entering folds on the parietal wall, 1 on the outer lip above the periphery. *Basal lip* with a thick callosity only, or 1 to 3 short lamellæ on it. *Peristome* sharp, dark-edged. *Columella* short arcuate. *Inner lip* thin, expanded. *Perforation* narrow, deep, open.

Diameter, 3·5 mm.; height, 2·3 mm.

Dentition.—Suter, T.N.Z.I., xxiv, 298, pl. 23, f. 41, 42.

Jaw arcuate, with about 24 broad vertical plaits, which are strongly papillate.

Radula with the formula 110 × 30 + 1 + 30. Central tooth long and narrow, with a short cusp. Lateral and marginal teeth bicuspid, the inner cusp longer than the outer.

Type in the Canterbury Museum, Christchurch.

Hab.—North Island: Remuera, Auckland, type (Cheeseman); Waiwera; Waiheke Island; Thames; Hillyer's Creek; Mount Wellington lava-fields; Hunua Range; Tuakau; Tarukenga; Mount Pirongia; Wanganui; Seventy-mile Bush; Forty-mile Bush; Waimarama; Wellington. South Island: Kenepuru.

Forma albina.

Perfectly white specimens from Auckland and the Hunua Range are in my collection.

5. Laoma pirongiaensis, Suter, 1894. Plate 29, fig. 5, *a*.

Laoma pirongiaensis, Suter, P.L.S. N.S.W. (2), viii, 1894, 491, pl. 22, f. 6–6*b*; Suter, J. de Conch., xli, 275.

Shell very small, conoidal, subperforated, horn-colour, with rather distant membranous plaits, not shining, thin, semitransparent. *Sculpture:* Protoconch with microscopic spiral lines; succeeding whorls with oblique membranous plaits, about 7 per millimetre; interstices with fine growth-lines, crossed by microscopic spiral striæ, more distant and more conspicuous on the base. *Colour* horny, banded with rufous, in zigzag lines on the last whorl, extending over base. *Spire* conoidal, somewhat higher than the aperture; outlines lightly convex. *Protoconch* of 1½ convex turns. *Whorls* 5½, slowly and regularly

increasing, flattened, the last subangulated; base flatly rounded. *Suture* not deep, simple. *Aperture* oblique, lunate, with 6 lamellæ in the adult—2 or 3 on the parietal wall, the inner of which is stouter and longer; 2 very thin lamellæ on the outer wall, the upper one smaller, inconspicuous; 2 strong lamella upon the base, the inner one at the base of the columella: in younger specimens there are only 4 lamellæ, those on the outer wall are not developed. *Peristome* thin, sharp, but strongly callous within in adult specimens. *Columella* very short, vertical. *Inner lip* slightly reflexed and almost completely sealing up the very narrow perforation.

Diameter, 2 mm.; height, 1·9 mm.

Animal unknown.

Type in my collection.

Hab.—North Island: Mount Pirongia, type (Urquhart); Toko, Stratford (R. Murdoch).

6. **Laoma pœcilosticta**, Pfeiffer, 1853. Plate 11, fig. 2.

Helix pœcilosticta, Pfr., M.H. Viv., iii, 1853, 59. *H. pœcilocostata*, Pfr., P.Z.S., 1852 (1854), 147 (err.). *H. pœcilosticta*, Pfr.: Reeve, Conch. Icon., vii, pl. 132, f. 815; Conch. Cab. (2), i, 470, pl. 156, f. 11–13. *H.* (*Thalassia*) *pœcilosticta*, Pfr.: Hector, Cat. Land Moll. N.Z., 8. *Nanina* (*Thalassia*) *pœcilosticta*, Pfr., Nomencl. Hel. Viv., 47. *Helix pœcilosticta*, Pfr.: Hutton, M.N.Z.M., 17. *Endodonta pœcilosticta*, Pfr.: Hutton, T.N.Z.I., xvi, 195. *Helix* (*Endodonta*) *pœcilosticta*, Pfr.: Tryon, Man. Conch. (2), iii, 68, pl. 13, f. 56. *Laoma pœcilosticta*, Pfr.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 646; Suter, J. de Conch., xli, 274.

Shell very small, trochiform, subperforated, thin, closely plaited, horny with rufous spots, suture margined, last whorl keeled. *Sculpture:* Protoconch microscopically very finely spirally striated; the following whorls with close oblique retractive flattish riblets, about 15 per millimetre; the interstices with fine growth-lines, and very fine, often obsolete, spiral striæ, usually more distinct on the base. *Colour* fulvous or horny, spotted with reddish-brown, the cord above the suture regularly dotted with horny and brown. *Spire* conical, slightly higher than the aperture; outlines somewhat convex. *Protoconch* of $1\frac{1}{2}$ convex turns. *Whorls* $5\frac{1}{2}$, narrow, somewhat convex, the last keeled; base flatly rounded. *Suture* deep, margined above by a narrow cord on the lower whorls only. *Aperture* a little oblique, depressed, angularly lunate, with an entering thick lamella on the middle of the columella. *Peristome* simple, straight, strengthened inside by a white callus. *Columella* short, oblique. *Inner lip* with a thick callosity, reflexed, and almost completely closing the narrow perforation.

Diameter, 4 mm.; height, 3·25 mm.

Dentition.—Hutton, T.N.Z.I., xvi, 168.

Jaw arched, not tapering, of 21 imbricating plates, covered thickly with papillæ.

Radula with the formula 23 + 1 + 23. Central tooth unicuspid; laterals and marginals rather oblique, bicuspid, with small points.

Type in the British Museum.

Hab.—North Island: Whangarei (Musson); Little Barrier Island (Adams); near Auckland; Waitakerei Range (H. S.); Thames (Adams); Hunua Range (Major Broun); Mounts Taupiri and Pirongia (Urquhart); Napier; Wellington.

Forma albina.

Perfectly white specimens are not rare.

Subsp. conicula, Suter, 1907. Plate 11, fig. 1.

Laoma pœcilosticta conicula, Suter, P. Mal. S., vii, 1907, 236, pl. 22, f. 1.

Shell small, dome-shaped, imperforate, radially finely costate, suture margined, last whorl keeled, with a columellar plait. *Sculpture* consisting of close rounded flexuous radiate plications, extending over the base; the protoconch and the base are microscopically spirally striate, but the striæ are much more distinct on the latter. *Colour* fulvous, with rather faint longitudinal zigzag bands of rufous; margins of suture and keel on the last whorl with whitish dots. *Epidermis* thin, shining. *Spire* dome-shaped, with a blunt rounded apex. *Protoconch* of 1½ flatly convex volutions. *Whorls* 6, slowly increasing, flatly convex, as is also the base. *Suture* impressed, margined above on the last four whorls with a distinct thread. *Aperture* a little oblique, angularly lunate, breadth about twice the height. *Peristome* simple, straight. *Outer lip* but little convex, forming a distinct angle with the slightly rounded basal lip. *Columella* callous, oblique, with a not much pronounced plait. *Umbilical region* showing but a faint impression. No *perforation*, not even in young examples.

Diameter, 3 mm.; height, 3·2 mm.

Animal unknown.

Type in my collection.

Hab.—North Island: Kaihu, Hokianga, type (Strickland); Waiwera (H. S.).

Subgen. 2. Phrixgnathus, Hutton, 1883.

Phrixgnathus, Hutton, T.N.Z.I., xv, 1882 (1883), 136. Type: *Helix fatua*, Hutt., 1882; not of Pfeiffer = *Phrixgnathus Celia*, Hutt., 1883. Pilsbry. Man. Conch. (2), ix, 9.

Animal and shell the same as in *Laoma*, s. str., except that the aperture has no teeth or folds within.

Distribution.—New Zealand and its subantarctic islands, Tasmania, southern and eastern parts of Australia, and British New Guinea.

1. *Group of* Laoma Mariæ.

Shell imperforate.

KEY TO SPECIES.

A. Shell smooth; periphery convex .. .. *lucida.*
B. Shell costate or rib-striate; periphery angled or carinated.
  a. Shell minute, with membranous riblets, 8–10 per millimetre; periphery angled .. .. *filicosta.*
  b. Shell larger, with fine rib-striæ, 20 per millimetre; perpihery acutely keeled .. .. *Mariæ.*

1. Laoma filicosta, Suter, 1907. Plate 11, fig. 3.

Laoma (*Phrixgnathus*) *filicosta*, Suter, P. Mal. S., vii, 1907, 236, pl. 22, f. 3.

Shell minute, turbinate, imperforate, fulvous, with fuscous radial streaks and distant riblets. *Sculpture* consisting of very fine and oblique flexuous riblets, 8 to 10 per millimetre; they are sharp, thin, membranous, white, and extending over the base to the umbilical region; the interstices with numerous microscopic incremental striæ; protoconch and base with spiral liræ. *Colour* fulvous, radially ornamented with zigzag bands of rufous at about the same distance apart as the riblets. *Epidermis* thin, not shining. *Spire* convexly conoidal, with a blunt and rounded apex, its height equal to that of the aperture. *Protoconch* of 1½ smooth flat volutions. *Whorls* 4½, slowly and regularly increasing, flatly convex, the last distinctly angled at the periphery; base rounded, umbilical region slightly impressed. *Suture* not deep. *Aperture* somewhat oblique, lunate. *Peristome* sharp, straight. *Columella* short, arcuate. *Inner lip* but little callous, extended over the umbilical region.

Diameter, 1·75 mm.; height, 1·25 mm.

Animal unknown.

Type in my collection.

Hab.—North Island: Wairangi, Waikato, in a swampy kahikatea bush (A. Suter).

2. Laoma lucida, Suter, 1896. Plate 10, figs. 8, *a*, *b*.

Laoma (*Phrixgnathus*) *lucida*, Suter, P. Mal. S., ii, 1896, 36, pl. 4. f. 13–15.

Shell very small, depressed turbinate, imperforate when adult, yellowish-horny, smooth, pellucid, shining. There is no *sculpture*, except microscopic growth-lines without spiral striation. *Colour* uniformly yellowish-horny. *Spire* conoidal, of about the same height as the aperture; outlines lightly convex. *Protoconch* smooth, convex. *Whorls* 5, gradually increasing, convex, periphery rounded. *Suture* rather deep, very narrowly margined below. *Aperture* oblique, lunate, transverse. *Peristome* straight, acute, somewhat callous inside. *Columella* very short, oblique, arcuate. *Inner lip* with a white

callus, reflexed, completely covering the very narrow perforation, which is open in young examples. The *umbilical region* is broadly impressed.

Diameter—Maj., 3 mm. ; min., 2·75 mm. : height, 2 mm.

Jaw and *radula* are typical. The formula of the latter is 20 + 1 + 20.

Type in my collection.

Hab.—North Island : Near Auckland (Wright).

3. Laoma Mariæ, Gray, 1843. Plate 29, fig. 6.

Nanina Mariæ, Gray, Dieff. N.Z., 262. *Helix Mariæ*, Gray, Conch. Icon., vii, pl. 131, f. 804 ; M.H. Viv., i, 81 ; Conch. Cab. (2), i, pt. 2, 462, pl. 155, f. 40–42 ; Cat. Brit. Mus. Pulmonata, 135 ; Ereb. & Ter., I, pl. I, f. 2. *H. (Thalassia) Mariæ*, Gray : Hector, Cat. Land Moll. N.Z., 5 ; Nomencl. Hel. Viv., 46. *Nanina Mariæ*, Gray : Hutton, M.N.Z.M., 25. *Phrixgnathus Mariæ*, Gray : Hutton, T.N.Z.I., xvi, 196. *Helix (Phrixgnathus) Mariæ*, Gray, Man. Conch. (2), iii, 37, pl. 21, f. 11. *H. umbraculum*, Pfeiffer, P.Z.S., 1852 (1854), 147 ; M.H. Viv., iii, 39. *Laoma (Phrixgnathus) Mariæ*, Gray : Hedley and Suter, P.L.S. N.S.W. (2), vii, 647 ; Suter, J. de Conch., xli, 275.

Shell small, imperforate, somewhat lentiform, rather thin, very faintly shining, corneous with fine brown zigzag lines. *Sculpture* consisting of very fine oblique rib-striæ, about 20 per millimetre, crossed by microscopic fine and dense spiral lines, almost obsolete on the embryonic whorls. *Colour* corneous, with fine and close antecurrent rufous zigzag lines ; suture and periphery ornamented with equidistant small brown spots. *Epidermis* thin, unctuously glossy. *Spire* conoidal, very little higher than the aperture ; outlines lightly convex. *Protoconch* pointed, of 1½ turns. *Whorls* 5 to 5½, flattish, periphery acutely keeled ; base convex, slightly impressed at the centre. *Suture* distinctly margined on the lower whorls. *Aperture* oblique, depressed, subtriangular. *Peristome* simple, acute, straight. *Outer lip* sharply angled. *Columella* short, arcuate. *Inner lip* slightly callous, shortly reflected above. There is a narrow false *umbilicus*.

Diameter—Maj., 7·5 mm. ; min., 7 mm. : height, 3·7 mm.

Dentition.—Hutton, T.N.Z.I., xvi, 172, pl. 9, f. R.

Jaw arcuate, not tapering, papillate, with about 33 plaits.

Radula having the formula 47 + 1 + 47 ; central tooth with 1 long cutting-point ; laterals and marginals bicuspid, the inner cutting-point longer than the outer.

Type in the British Museum.

Hab.—North Island : Whangarei ; Wade ; Auckland ; Waiheke Island ; Thames ; Hunua Range ; Tuakau ; Wairangi ; Tirau ; Ohaupo ; near Waitomo Caves ; Tarukenga ; Mount Pirongia ; Heretaunga ; Wanganui ; Mount Egmont, 3,000 ft. to 4,500 ft. ; Ngaputahi and Ruatahuna, Tuhoe-land ; Seventy-mile Bush ; Forty-mile Bush ; Wellington.

2. *Group of* Laoma conella.

Shell subperforate, perforation more or less closed by the reflection of the inner lip.

KEY TO SPECIES.

A. Shell with radiate riblets or rib-striæ.
- *a.* Riblets 4–5 per millimetre, membranous; spire about 1½ times the height of the aperture .. .. .. *Francesci.*
- *aa.* Riblets about 10 per millimetre.
  - *b.* Riblets sharp, 10–12 per millimetre; protoconch spirally striate; periphery convex; diameter, 1·5 mm. .. *allochroida.*
  - *bb.* Rib-striate; protoconch smooth; periphery angled .. *Ariel.*
  - *bbb.* Radiate striæ; protoconch spirally lirate; periphery convex; diameter, 3 mm. .. .. .. *elaiodes.*
- *aaa.* Riblets 25–30 per millimetre .. .. .. *sericata.*

B. Shell smooth.
- *a.* Periphery keeled, suture margined.
  - *b.* Protoconch spirally striate; 6 whorls; diameter, 4·5 mm. .. .. *Cheesemani.*
  - *bb.* Protoconch smooth; 5 whorls; diameter, 3–3·5 mm. *conella.*
- *aa.* Periphery distinctly angled.
  - *b.* Periphery lightly angled; protoconch reticulate; spire a little higher than the aperture .. .. *elevata.*
  - *bb.* Periphery sharply angled; protoconch smooth; height of spire less than that of the aperture .. .. *fulgurata.*
- *aaa.* Periphery convex, subangled in the young; protoconch smooth.
  - *b.* Spire 1½ times the height of the aperture .. .. *sublucida.*
  - *bb.* Height of spire a little less than that of the aperture.. *viridula.*

4. Laoma allochroida, Suter, 1890. Plate 29, fig. 7.

Hyalina allochroida, Sut., T.N.Z.I., xxii, 1889 (1890), 228, pl. 15, f. 14, *a–c*.
Laoma allochroida, Sut.: Pilsbry, Man. Conch. (2), viii, 63, pl. 23, f. 3–6.
L. (*Phrixgnathus*) *allochroida*, Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 649; Suter, J. de Conch., xli, 281.

Shell minute, subglobose, subperforate, radially sharply costate, corneous, thin, pellucid. *Sculpture:* Protoconch smooth, with rather distant microscopic spiral lines; the following whorls are radially finely and sharply ribbed, 10 to 12 riblets per millimetre, they are oblique, retractive, and somewhat arcuate on the periphery; interstices with numerous microscopic growth-lines, reticulated by less distinct spiral striæ. *Colour:* The first three whorls are almost colourless, the penultimate corneous, and the last light fulvous. *Epidermis* thin, lightly shining. *Spire* conoidal, of about the same height as the aperture; outlines broadly convex. *Protoconch* of 1½ whorls, flattish. *Whorls* 5, convex, regularly increasing; periphery and base rounded. *Suture* deep. *Aperture* somewhat oblique, rotundly lunate. *Peristome* straight, acute, margins convergent. *Columella* very short, arcuate. *Inner lip* reflexed and partly concealing the very narrow perforation.

Diameter, 1·5 mm.; height, 1 mm.

Animal unknown.

Type in my collection.

Hab.—North Island: Hunua Range (Major Broun); Mount Pirongia (Urquhart); Rusthall, Wanganui (R. Murdoch); Seventy-mile Bush (Chadwick); Mauriceville, type (H. S.). South Island: Hooker Valley (H. S.). Found under dead leaves in mould, but easily overlooked, and therefore apparently rare.

Subsp. **sericata**, Suter, 1890.

Hyalina allochroida, var. *sericata*, Sut., T.N.Z.I., xxii, 1889 (1890), 228, pl. 15, f. 15, *a*, *b*. *Laoma allochroida sericata*, Sut.: Pilsbry, Man. Conch. (2), viii, 64, pl. 23, f. 7–9. *L.* (*Phrixgnathus*) *allochroida sericata*, Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 649; Suter, J. de Conch., xli, 281.

Shell minute, depressed, subperforate, silky, with very fine radiate riblets, corneous, thin, pellucid. *Sculpture:* Protoconch smooth, microscopically spirally striate, the succeeding whorls with fine and close radial riblets, 25–30 per millimetre; they are obliquely retractive and slightly undulating over the periphery. *Spire* low, broadly convex. *Protoconch* of 1½ whorls, flatly rounded. *Whorls* 5, slowly and regularly increasing, narrow, rounded; base and periphery convex. *Suture* deep. *Aperture* oblique, lunate, higher than broad. *Peristome* straight, acute, upper margin somewhat advancing. *Columella* short. *Inner lip* not reflexed. *Perforation* very narrow, open.

Diameter, 1·2 mm.; height, 0·7 mm.

Animal unknown.

Type in my collection.

Hab.—North Island: Mount Pirongia (Urquhart); Seventy-mile Bush (Chadwick); Forty-mile Bush, type (H. S.). Found in mould, but very easily overlooked.

5. **Laoma Ariel**, Hutton, 1883. Plate 29, fig. 8.

Phrixgnathus Ariel, Hutt., N.Z.J.S., i, 1883, 476: T.N.Z.I, xvi, 177, 196. *Laoma Ariel*, Hutt., Man. Conch. (2), viii, 59. *L.* (*Phrixgnathus*) *Ariel*, Hutt.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 647; Suter, J. de Conch., xli, 278.

Shell very small, depressed turbinate, subperforate, scarcely shining, finely ribbed, thin, corneous, with radial brown streaks. *Sculpture* of the post-nuclear whorls consisting of fine oblique radial rib-striæ, about 10 per millimetre, often somewhat indistinct, the interstices with fine growth-lines and rather indistinct fine microscopic spiral lines, a little more distinct on the base. *Colour* corneous, usually with radiate zigzag streaks of fulvous. *Spire* conoidal, depressed, a little higher than the aperture; outlines lightly convex. *Protoconch* of 1½ smooth flattish whorls. *Whorls* 5, slowly increasing, flatly rounded; periphery more or less distinctly angled, base convex. *Suture* impressed. *Aperture* oblique, lunate. *Peristome* thin, acute, slightly callous within, outer lip angled. *Columella* very short, arcuate.

Inner lip with a thin callosity, reflexed and almost completely covering the narrow perforation.

Diameter—Maj., 3·25 mm. ; min., 3 mm. : height, 2·5 mm.

Jaw and *radula* normal. Formula of the latter 32 + 1 + 32. Central tooth unicuspid, lateral and marginal teeth bicuspid, all with minute points.

Type in the Canterbury Museum, Christchurch.

Hab.—North Island : Cape Camel ; Whangarei ; Hokianga ; Wade ; Little Barrier Island ; Auckland (type) ; Waitakerei Range ; Thames ; Hunua Range ; Wairangi ; Ohaupo ; Mount Pirongia ; Ngaputahi and Ruatahuna, Tuhoe-land ; Ormondville ; Forty-mile Bush ; Wanganui ; Toko, near Stratford ; Dannevirke ; Wellington. South Island : Nelson.

6. Laoma Cheesemani, Suter, 1894. Plate 10, figs. 13, *a*, 13*b*.

Phrixgnathus Cheesemani, Sut., T.N.Z.I., xxvi, 1893 (1894), 137, pl. 21, f. 40–40*b*. *Laoma* (*Phrixgnathus*) *Cheesemani*, Sut., J. de Conch., xli, 282.

Shell small, conoidly semiglobose, subperforate, corneous, thin, rather shining, diaphanous. *Sculpture :* Protoconch and succeeding whorls with microscopic fine spiral lines, not always very distinct on the upper surface ; growth-striæ somewhat irregular, close, oblique. *Colour* pale-horny, sometimes variegated with light-brown zigzag bands, which are close together, and tessellating on the base. *Spire* conoidal, its height equal to that of the aperture ; outlines convex. *Protoconch* of 1½ turns, flatly rounded. *Whorls* 6, slowly and regularly increasing, slightly convex ; periphery keeled, base flatly rounded. *Suture* not much impressed, very narrowly margined. *Aperture* oblique, broadly lunate. *Peristome* simple, straight, acute. *Outer lip* angled, slightly callous within. *Columella* short, arcuate. *Inner lip* callous, reflexed, and almost completely closing up the very narrow perforation.

Diameter—Maj., 4·5 mm. ; min., 4·1 mm. : height, 3 mm.

Jaw and *radula* normal ; formula of the latter 40 + 1 + 40.

Type in my collection.

Hab.—Waitakerei Range (Cheeseman).

7. Laoma conelia, Pfeiffer, 1862. Plate 29, fig. 9.

Helix conella, Pfr., Mal. Bl., viii, 147 ; M.H. Viv., v, 86 ; M.N.Z.M., 17. *Nanina* (*Thalassia*) *conella*, Pfr., Nomencl. Hel. Viv., 47. *Phrixgnathus conella*, Pfr. : Hutton, T.N.Z.I., xvi, 196. *Laoma conella*, Pfr., Man. Conch. (1), viii, 58, pl. 23, f. 16. *L.* (*Phrixgnathus*) *conella*, Pfr. : Hedley and Suter, P.L.S. N.S.W. (2), vii, 647 ; Suter, J. de Conch., xli, 277.

Shell very small, depressed turbinate, subperforate, keeled at the circumference, silky, thin, pellucid. *Sculpture* consisting of very delicate oblique growth-striæ, about 60 per millimetre, crossed by faint microscopic spiral lines. *Colour* horny, with close irregular stripes of tawny brown, which radiate below and descend obliquely

forward above. *Spire* low conoidal, its height equal to that of the aperture; outlines lightly convex. *Protoconch* flattish, of 1½ smooth turns. *Whorls* 5, regularly increasing, rather convex; periphery keeled, base rounded. *Suture* deep, narrowly margined above. *Aperture* somewhat oblique, sublunate. *Peristome* simple, thin, the upper lip arched forward. *Outer lip* angled, with a thin white callus inside. *Columella* very short, arcuate. *Inner lip* callous, expanded. *Perforation* minute, almost concealed in the adult.

Diameter—Maj., 3·5 mm.; min., 3·4 mm.: height, 2·8 mm.

Formula of *radula* 38+1+38; the teeth normal.

Type in the K.K. Hofmuseum, Vienna.

Hab.—North Island: Kakepuku, type (Hochstetter); Auckland (Gillies); Mount Wellington lava-fields; Hillyer's Creek (Musson); Thames (Adams); Hunua Range (Major Broun); Ohaupo (Musson); Heretaunga; Toko, near Stratford (R. Murdoch); Waimarama (A. Hamilton); Tarukenga; Mount Pirongia; Wade; Horokiwi.

8. Laoma elaiodes, Webster, 1904. Plate 29, fig. 10.

Laoma (*Phrixgnathus*) *elaiodes*, Webst., P. Mal. S., vi, 1904, 106, f. 5, 6 in text.

Shell turbinate, olive-green, shining, subperforate, finely striate. *Sculpture:* Protoconch concentrically striate; the succeeding whorls irregularly radiately finely striate and substriate, about 10 striations per millimetre, substriations variable in number and extent, both directed backwards; the whole shell concentrically wave-striated. *Colour* olive-green. *Protoconch* 1½ whorls. *Whorls* 4½, rounded, periphery and base rounded. *Suture* deep. *Lip* simple, margins slightly converging. *Columella* vertical, reflexed above, slightly covering the umbilicus, which is narrow, pervious. (Webster.)

Diameter, 3 mm.; height, 2 mm.

The *generative system* (Plate 1, fig. 20) is very similar to that of other members of the genus, and the characteristic features scarcely differ from those in *Flammulina* and *Endodonta*. The penis (*p.*) is comparatively large, with the distal portion folded upon itself; the retractor muscle (*r.m.*) is inserted at the apex. The vas deferens (*v.d.*) also separates from the apex; it is a very slender tube, and forms a loop round the distal portion of the penis. The receptaculum seminis (*r.s.*) is a narrow tube with a globose termination. The large pouch-like sacculation (*s.c.*) of the uterus appears to be a very constant feature in all three genera; the prostate and female ducts (*o.v.d.*) branch from its lower, anterior portion, and the former is partly concealed in the lower, concave surface. Other organs scarcely call for notice; the right ocular retractor passes between the branches of the genital system. Albumen-gland (*alb.g.*). (R. Murdoch.)

Type in Mr. Webster's collection.

Hab.—Waiuku; scarce.

I have not seen this species.

9. **Laoma elevata**, Suter, 1896. Plate 29, fig. 11.

Laoma (*Phrixgnathus*) *lucida*, Sut., var. *elevata*, Sut., P. Mal. S., ii, 1896, 36.

Shell small, globosely turbinate, subperforate, smooth and shining, thin, pellucid, corneous. *Sculpture* microscopic, all whorls, protoconch included, being finely reticulated, the spirals predominating on the base. *Colour* corneous. *Spire* conoidal, slightly higher than the aperture; outlines convex. *Protoconch* of $1\frac{1}{2}$ whorls, rather large, convex. *Whorls* 5, narrow, slowly increasing, convex, periphery distinctly angled, base flatly rounded, slightly impressed around the umbilical perforation. *Suture* rather deep. *Aperture* transverse, slightly oblique, lunate. *Outer lip* angled. *Peristome* simple, thin and sharp, not callous within. *Columella* very short, arcuate. *Inner* lip thin, reflexed above, and partly closing the very narrow perforation.

Diameter—Maj., 3 mm.; min., 2·75 mm.: height, 2·5 mm.

Animal unknown.

Type in my collection.

Hab.—North Island: Whangarei (collected by the late Mr. Grosch).

10. **Laoma Francesci**, Webster, 1904. Plate 29, fig. 12.

Laoma (*Phrixgnathus*) *Francesci*, Webster, P. Mal. S., vi, 1904, 106, f. 1 in text.

Shell turbinate, dark brown, dull. *Sculpture*: Protoconch concentrically striate, the remaining whorls, besides concentric wavy striæ, having 4–5 radiate brown white-edged periostracal processes per millimetre, directed backward, with many hair-like growth-lines between. *Protoconch* $1\frac{1}{2}$ whorls. *Whorls* $4\frac{1}{2}$, rounded, periphery and base rounded. *Suture* deep. *Lip* simple, margins slightly converging. *Columella* vertical, reflexed above, slightly covering the narrow pervious umbilicus. (Webster.)

Diameter, 2 mm.; height, 1·75 mm.

Animal unknown.

Type in Mr. Webster's collection.

Hab.—Waiuku, tea-tree scrub; scarce.

I have not seen this species.

11. **Laoma fulgurata**, Suter, 1909. Plate 29, fig. 13.

Laoma (*Phrixgnathus*) *fulgurata*, Sut., P. Mal. S., viii, 1909, 262, pl. 11, f. 28.

Shell very small, depressed, almost imperforate, horny with broad streaks and zigzag lines of brown, not shining, thin and pellucid, periphery sharply angled. *Sculpture* consisting of exceedingly fine and dense growth-lines, and distinct microscopic spiral liræ on the base. *Colour* corneous, with irregular brown streaks on the upper surface, but forming rather regular broad zigzag lines on the base. *Spire* depressed, broadly convex, its height less than that of the aperture. *Protoconch* flattish, of $1\frac{1}{2}$ smooth volutions. *Whorls* $4\frac{1}{2}$, regularly increasing, flatly convex, the last rather high in proportion;

periphery sharply angled, base convex, a little depressed in the centre. *Suture* not much impressed, simple. *Aperture* oblique, transverse, lunate. *Peristome* thin and sharp. *Outer lip* angled. *Columella* subvertical, short, arcuate. *Inner lip* reflexed above and almost completely closing the very narrow perforation.

Diameter, 3·2 mm. ; height, 2 mm.

Animal unknown.

Type in my collection.

Hab.—Waitakerei Range (H. S.).

12. **Laoma sublucida,** Suter, 1896. Plate 29, fig. 14.

Laoma (*Phrixgnathus*) *sublucida,* Suter, P. Mal. S., ii, 1896, 37.

Shell very small, depressed turbinate, subperforate, corneous, glossy, semitransparent, smooth, periphery rounded or very lightly angled. There is no *sculpture,* except fine oblique growth-lines. *Colour* corneous, very often with faint radiate rufous streaks, extending to the umbilicus. *Spire* conoidal, its height 1½ times that of the aperture ; outlines convex. *Protoconch* of 1½ turns, blunt. *Whorls* 5, regularly increasing, flatly rounded ; periphery convex or lightly angled, base flatly rounded. *Suture* impressed. *Aperture* transverse, lunate. *Peristome* straight, acute, slightly callous within. *Outer* and *basal lips* regularly arched. *Columella* very short, oblique. *Inner lip* callous, reflexed, and partly covering the very narrow pervious perforation, quite open in young specimens.

Diameter—Maj., 3 mm. ; min., 2·75 mm. : height, 2 mm.

Animal unknown.

Type in my collection.

Hab.—Waitakerei Range (Cheeseman, H. S.).

13. **Laoma viridula,** Suter, 1909. Plate 29, fig. 15.

Laoma (*Phrixgnathus*) *viridula,* Sut., P. Mal. S., viii, 1909, 263, pl. 11, f. 29.

Shell minute, depressed globose, subperforate, corneous, very thin, translucent, lightly shining, smooth. *Sculpture* microscopic ; the post-nuclear whorls with fine oblique growth-striæ, reticulated by distinct fine spiral lines. *Colour* corneous, with a greenish hue. *Spire* depressed conoidal, its height a little less than that of the aperture ; outlines almost straight. *Protoconch* of 1½ convex whorls, smooth. *Whorls* 4, regularly increasing, convex ; periphery rounded, lightly subangled ; base convex, impressed at the middle. *Suture* rather deep. *Aperture* oblique, broadly rotundly lunate. *Peristome* simple, sharp and thin, regularly arched. *Columella* short, arcuate. *Inner lip* reflexed above, and almost completely closing the narrow perforation.

Diameter—Maj., 2·5 mm. ; min., 2·3 mm. : height, 1·7 mm.

Animal unknown.

Type in my collection.

Hab.—South Island : Capleston, near Reefton (Cavell).

3. *Group of* Laoma Erigone.

Umbilical perforation narrow or moderate, quite open, its diameter one-sixth or less of the greatest diameter of the shell.

KEY TO SPECIES.

A. Upper surface of shell with radial riblets.
  a. Riblets ciliated at suture and periphery.
    b. Spire 3 times the height of the aperture .. .. *regularis.*
    bb. Spire 1½ times the height of the aperture .. *spiralis.*
  aa. Periphery convex; crisp riblets on upper surface .. *Campbellica.*
  aaa. Periphery bluntly or distinctly angled.
    b. Riblets serrate, interstices reticulated .. .. *serratocostata.*
    bb. Riblets simple.
      c. Last whorl only with riblets, 10 per millimetre; spire 2½ times the height of the aperture .. *Erigone.*
      cc. Whorls with fine close riblets, 50 per millimetre; spire 1½ times the height of the aperture .. *cognata.*
      ccc. Whorls with distant riblets, 5 per millimetre; spire the same height as the aperture .. *Phrynia.*

B. Upper surface of shell with more or less distinct growth-lines only.
  a. Suture margined.
    b. Protoconch with microscopic spiral lines; suture prominently margined, periphery keeled .. *marginata.*
    bb. Protoconch smooth.
      c. Periphery subangled, suture faintly margined .. *Alfredi.*
      cc. Periphery sharply angled; perforation open, nearly one-fifth of diameter .. .. *Trailli.*
      ccc. Periphery acutely keeled; perforation narrow, sometimes partly hidden .. .. *transitans.*
  aa. Suture simple.
    1. Periphery perfectly convex.
      b. Only the protoconch has microscopic spiral lines; spire lower than the aperture .. .. *Hamiltoni.*
      bb. Protoconch smooth, following whorls spirally microscopically striate; height of spire equal to that of the aperture .. .. .. *microreticulata.*
    2. Periphery but lightly angled.
      b. Spire half the height of aperture; perforation one-tenth of diameter .. .. .. *compressa.*
      bb. Height of spire a little less than that of the aperture; perforation one-sixth of diameter .. *glabriuscula.*
    3. Periphery distinctly angled or subcarinated.
      b. Shell fulvous, no colour-markings; dimensions, 5 mm. by 2⅓ mm. .. .. .. *fatua.*
      bb. Shell with brown streaks.
        c. Microscopic spirals obsolete; spire a little higher than the aperture .. .. *Haasti.*
        cc. Microscopic spirals distinct; height of spire a little less than that of the aperture .. *Moellendorffi.*
    4. Periphery keeled.
      b. Protoconch smooth; spire a little higher than the aperture; dimensions, 3¾ mm. by 2½ mm. *Celia.*
      bb. Protoconch with microscopic spirals; height of spire equal to that of the aperture; dimensions, 4¼ mm. by 3 mm. .. .. .. *liratula.*

14. Laoma Alfredi, Suter, 1909. Plate 29, fig. 16.

Laoma (*Phrixgnathus*) *Alfredi*, Sut., P. Mal. S., viii, 1909, 262, pl. 11, f. 27.

Shell minute, depressed globose, perforate, corneous, thin, pellucid, polished. The only *sculpture* on the post-nuclear whorls consists of microscopic faint spiral lines, more distinct on the base; growth-lines sometimes rib-striate. *Colour* corneous, at irregular intervals there are radiate white lines on the last two whorls, produced by the narrow callosity left of former peristomes. *Spire* conoidal, its height equal to that of the aperture; outlines lightly convex. *Protoconch* flatly rounded, smooth. *Whorls* 5, slowly and regularly increasing, convex; periphery subangled, base flatly rounded. *Suture* impressed, faintly margined. *Aperture* oblique, lunate. *Peristome* simple, straight, with a conspicuous inner white callus. *Outer lip* descending rapidly and but little arched. *Columella* short, subvertical, arcuate. *Inner lip* slightly expanded. *Perforation* narrow, deep, open, about one-twelfth of the greatest diameter.

Diameter, 2·5 mm.; height, 1·6 mm.

Animal unknown.

Type in my collection.

Hab.—Birkenhead, near Auckland (Alfred Suter).

15. Laoma Campbellica, Filhol, 1880.

Helix Campbellica, Filh., Bull. Soc. Philomathique, iv, 126; Miss. I.C., 1885, 570. *Microphysa Campbellica*, Filh.: Hutton, T.N.Z.I., xvi, 195. *Laoma* (*Phrixgnathus*) *Campbellica*, Filh.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 649; Suter, J. de Conch., xli, 278.

Shell very small, perforated, subglobose, depressed, corneous, with crisp riblets. *Sculpture* consisting of crisped ribs above, and fine striæ below. *Colour* uniformly horny. *Whorls* $4\frac{1}{2}$, rather convex, regularly increasing. *Suture* deeply impressed. *Aperture* rounded. *Peristome* simple, acute, straight. Columellar margin slightly reflected. *Perforation* minute. (Filhol.)

Diameter, 3 mm.; height, 2 mm.

Animal unknown.

Type in the Mus. Hist. Nat., Paris.

Hab.—Campbell Island (Filhol).

I have not seen this species.

16. Laoma Celia, Hutton, 1883. Plate 29, fig. 17.

Phrixgnathus Celia, Hutt., N.Z.J.S., i, 1883, 476; T.N.Z.I., xvi, 176, 197. *Laoma Celia*, Hutt.: Pilsbry, Man. Conch. (2), viii, 60: ix, pl. 1, f. 10. *L.* (*Phrixgnathus*) *Celia*, Hutt.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 648; Suter, J. de Conch., xli, 278. *Helix fatua*, Pfr.: Hutton, T.N.Z.I., xiv, 153; not of Pfeiffer.

Shell small, depressed, smooth, shining, narrowly umbilicated, horny with brown bands, carinated. *Sculpture* microscopic, the post-embryonic whorls with fine oblique growth-lines, crossed by very

fine crowded spiral lines. *Colour* corneous, alternately flamed with whitish and reddish-brown above, horny-brown beneath. *Epidermis* lustrous, translucent. *Spire* conical, but little higher than the aperture; outlines very lightly convex. *Protoconch* of $1\frac{1}{2}$ smooth volutions. *Whorls* $5\frac{1}{2}$, regularly increasing, rather convex; periphery carinated, base very convex. *Suture* simple, slightly impressed. *Aperture* somewhat oblique, subrhomboidal. *Peristome* thin, sharp. *Outer lip* angled. *Columella* short, arcuate. *Inner lip* thin, expanded. *Umbilicus* narrow, open, showing part of the penultimate whorl, deep.

Diameter—Maj., 3·75 mm.; min., 3 mm.: height, 2·5 mm.

Animal with the mantle rather anterior, included; tail acute, without any mucous gland; peduncles long, slightly clavate, approximated at their bases. Colour greyish-brown, the anterior portion of the head darker; sometimes a dark transverse band under the shell. (Hutton.)

Dentition.—Hutton, T.N.Z.I., xiv, 153, pl. 3, f. F, N.; pl. 4, f. N (as *H. fatua*).

Jaw composed of about 20 imbricating, papillate plates.

Radula having the formula 20 + 1 + 20; central tooth with a single cusp and cutting-point; laterals and marginals bicuspid, the cusps and cutting-points equal, small.

Type in the Canterbury Museum, Christchurch.

Hab.—North Island: Thames (Adams); Howick (Major Broun); Tuakau; Wanganui; Wellington. South Island: Kenepuru; Temuka (Professor Chilton); Akaroa (F. Suter); Capleston; Greymouth; Dunedin, type (Hutton); Milford Sound; Owaka; Fortrose (Miss Rich); Invercargill (W. W. Smith); The Nuggets, Port Molyneux (A. Hamilton). Stewart Island: Half-moon Bay (A. Hamilton).

17. **Laoma cognata**, Suter, 1909. Plate 29, fig. 18.

Laoma (*Phrixgnathus*) *cognata*, Suter, Subantarct. Islds. N.Zeal., i, 1909, 38, pl. 1, f. 16.

Shell minute, conical, thin, finely costate, keeled, perforated. *Sculpture* consisting of exceedingly fine equal flexuous radiate riblets, about 50 per millimetre, crossed by fine microscopic spiral striæ. *Colour* yellowish-white, with radial broad and regularly spaced streaks of fulvous; base uniformly light brown. *Epidermis* thin, not shining. *Spire* conical, with a blunt apex, about $1\frac{1}{2}$ times the height of the aperture; outlines straight. *Protoconch* comparatively large, globose, of $1\frac{1}{2}$ quite smooth and strongly convex whorls. *Whorls* 5, regularly increasing, convex, the last sharply angled at the periphery; base convex. *Suture* deep. *Aperture* transverse, slightly oblique, subrhomboidal, not much excavated by the penultimate whorl. *Peristome* simple, thin, sharp. *Outer lip* angled; *basal lip* very lightly

convex. *Columella* short, arcuate. *Inner lip* reflexed above. *Umbilicus* quite open, narrow, pervious.

Diameter, 2·2 mm.; height, 1·7 mm.

Animal unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—Campbell Island, mostly on *Dracophyllum*, apparently not common, or perhaps easily overlooked (W. K. Chambers).

18. Laoma compressa, Suter, 1909. Plate 29, fig. 19.

Laoma (*Phrixgnathus*) *compressa*, Sut., P. Mal. S., viii, 1909, 261, pl. 11, f. 24.

Shell minute, depressed, perforated, yellowish-white, thin and shining, smooth. *Sculpture* of the post-embryonic whorls consisting of fine growth-lines, and microscopic very fine spiral striæ, more distinct upon the base. *Colour* uniformly yellowish-white. *Spire* low, lightly convex, its height about half that of the aperture. *Protoconch* convex, smooth. *Whorls* 4, regularly increasing, convex, periphery subangled; base convex. *Suture* simple, impressed. *Aperture* lunate. *Peristome* thin and sharp. *Columella* short, arcuate. *Inner lip* somewhat reflexed above. *Perforation* rather narrow, quite open, deep, about one-tenth of the greatest diameter.

Diameter, 1·4 mm.; height, 1·25 mm.

Animal unknown.

Type in my collection.

Hab.—Birkenhead, near Auckland (A. Suter).

The only specimen I have is very likely not quite adult.

19. Laoma Erigone, Gray, 1850. Plate 29, fig. 20.

Nanina Erigone, Gray, P.Z.S., 1849 (1850), 165. *Helix Erigone*, Gray, A.M.N.H. (2), vii, 65; M.H. Viv., iii, 60; Conch. Icon., vii, pl. 133, f. 817; Hector, Cat. Land Moll. N.Z., 7; M.N.Z.M., 18. *Nanina* (*Thalassia*) *Erigone*, Gray: Nomencl. Hel. Viv., 47. *Phrixgnathus Erigone*, Gray: Hutton, T.N.Z.I., xvi, 197. *Helix* (*Phrixgnathus*) *Erigone*, Gray, Man. Conch. (2), iii, 37, pl. 21, f. 13. *Laoma* (*Phrixgnathus*) *Erigone*, Gray: Hedley and Suter, P.L.S. N.S.W. (2), vii, 648; Suter, J. de Conch., xli, 276. *Helix Heldiana*, Pfeiffer, P.Z.S., 1852 (1854), 148; M.H. Viv., iii, 60; Hector, Cat. Land Moll. N.Z., 8. *Nanina* (*Thalassia*) *Heldiana*, Pfr., Nomencl. Hel. Viv., 47. *Helix Heldiana*, Pfr.: M.N.Z.M., 17.

Shell minute, turbinate, perforated, thin, almost smooth, periphery angled. *Sculpture* of the post-nuclear whorls consisting of fine oblique growth-lines, but the last whorl is mostly rib-striate, having about 10 riblets per millimetre; microscopic fine spiral lines are sometimes, though not always, present, more distinctly visible on the base. *Colour* light-horny, with broad equidistant radial bands of fulvous, not extending over the base. *Epidermis* thin, translucent, slightly shining. *Spire* conic, rather acute, its height about 2½ times that of the aperture. *Protoconch* globose, of 1½ smooth and flatly convex turns. *Whorls* 6 to 7, slightly convex; periphery distinctly angled.

base flattish. *Suture* simple, deep. *Aperture* a little oblique, depressed, subangularly lunate. *Peristome* simple, straight, sharp. *Outer lip* roundly angled. *Columella* short, vertical, arcuate. *Inner lip* subcallous, somewhat reflexed. *Umbilicus* narrow, deep, open, its diameter about one-sixth of the greatest diameter of the shell.

Diameter, 2·5 mm.; height, 2 mm.

Animal unknown.

Type in the British Museum.

Hab.—North Island: Auckland, type (Greenwood); Waitakerei Range (H. S.); Hillyer's Creek; Mount Wellington lava-fields; Ohaupo (Musson); Waiheke Island (H. S.); Howick; Hunua Range (Major Broun); Thames (Adams); Tuakau; Mount Pirongia (Urquhart); Waimarama (A. Hamilton).

Very often found on leaves of *Astelia*.

20. Laoma fatua, Pfeiffer, 1857.

Helix fatua, Pfr., P.Z.S., 1857, 107; M.H. Viv., iv, 30; Hector, Cat. Land Moll. N.Z., 15; M.N.Z.M., 19. *Laoma* (*Phrixgnathus*) *fatua*, Pfr.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 650; Suter, J. de Conch., xli, 277.

Shell perforated, turbinated, thinnish, irregularly finely striated, somewhat shining, fulvous. *Spire* conoidal, rather acute. *Whorls* 5–5½, moderately convex, the last not descending; periphery subcarinated, rather convex at the base. *Aperture* a little oblique, lunar. *Peristome* simple, straight. *Columellar margin* somewhat rigidly bent downwards. (Pfeiffer.)

Diameter—Maj., 5 mm.; min., 4·5 mm.: height, 2·3 mm.

Type in the British Museum.

Hab.—North Island: Taupiri (Hochstetter).

Remarks.—I have not seen this species. In the Canterbury Museum there are two specimens labelled "*Phrixgnathus fatua*, Pfr.," by the late Captain Hutton. They are identical with my *Laoma Trailli*, which I consider to be distinct from *L. fatua*, though no doubt nearly allied.

21. Laoma glabriuscula, Pfeiffer, 1853. Plate 29, fig. 21.

Helix glabriuscula, Pfr., P.Z.S., 1851 (1853), 262; Conch. Icon., vii, pl. 133, f. 822; Conch. Cab. (2), i, 470, pl. 156, f. 14–16; M.H. Viv., iii, 51; Hector, Cat. Land Moll. N.Z., 6. *Paryphanta glabriuscula*, Pfr.: Hutton, M.N.Z.M., 23. *Phrixgnathus glabriuscula*, Pfr.: Hutton, T.N.Z.I., xvi, 37. *Helix* (*Phrixgnathus*) *glabriuscula*, Pfr.: Man. Conch. (2), iii, 37, pl. 21, f. 14. *Laoma* (*Phrixgnathus*) *glabriuscula*, Pfr.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 650; Suter, J. de Conch., xli, 276.

Shell very small, conoidly semiglobose, perforate, thin, smooth, pellucid, shining. *Sculpture* microscopic, the post-embryonic whorls with fine growth-lines, decussated by fine spirals, which are stronger on the base. *Colour* pale yellow, angularly lined with rufous. *Spire*

conoidal, a little lower than the aperture; outlines convex. *Protoconch* of 1½ smooth rounded whorls, convex. *Whorls* 5½, slightly convex; periphery lightly angled, base flatly rounded. *Suture* simple, deep. *Aperture* oblique, subdepressed, lunate. *Peristome* simple, straight, acute. *Outer lip* roundly angled. *Columella* vertical, short. *Inner lip* thin, slightly reflexed above. *Perforation* moderate, quite open, deep, about one-sixth of the greatest diameter of the shell.

Diameter—Maj., 3·5 mm.; min., 3 mm.: height, 2 mm.

Dentition.—Suter, T.N.Z.I., xxiv, 297, pl. 22, f. 38, 39; Man. Conch. (2), ix, pl. 1, f. 3, 4.

Jaw (Plate 1, fig. 19) arcuate, consisting of about 20 broad slightly imbricating plaits, which are papillate.

Radula (Plate 1, fig. 19) having the formula 26 + 1 + 26; central tooth unicuspid, lateral and marginal teeth bicuspid.

Type in the British Museum.

Hab.—North Island: Whangarei; Mount Wellington lava-fields; Ohaupo (Musson); Little Barrier Island (Adams); Waiheke Island (H. S.); Helena Bay; Wade; Waitakerei; Thames; Taranaki (Cheeseman); Mount Pirongia (Urquhart); Waimarama (A. Hamilton); Seventy-mile Bush (Strickland). South Island: Kenepuru (McMahon).

22. **Laoma Haasti**, Hutton, 1883. Plate 9, figs. 22, *a*, *b*.

Phrixgnathus (?) *Haastii*, Hutt., N.Z.J.S., i, 1873, 476; T.N.Z.I., xvi, 177, 198. *Laoma Haastii*, Hutt., Man. Conch. (2), viii, 62, pl. 23, f. 91–93. *L.* (*Phrixgnathus*) *Haasti*, Hutt.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 650; Suter, J. de Conch., xli, 280, pl. 9, f. 5, *a*, *b*.

Shell minute, depressed, narrowly umbilicated, smooth, faintly shining, cinereous banded with brown. There is no *sculpture*, except fine oblique growth-lines, plicated at the suture, and obsolete microscopic spiral lines. *Colour* cinereous, with irregular radiating and zigzag bands of reddish-brown, very faint on the base. *Spire* conoidal, a little higher than the aperture; outlines slightly convex. *Protoconch* convex, of 1½ smooth volutions. *Whorls* 4½, slowly increasing, rounded; periphery distinctly angled, base convex. *Suture* impressed. *Aperture* subvertical, lunately subcircular. *Peristome* thin, arched. *Columella* vertical, short. *Inner lip* slightly expanded. *Umbilicus* moderate, pervious, showing the penultimate whorl, about one-sixth of the greatest diameter of the shell.

Diameter—Maj., 3 mm.; min., 2·5 mm.: height, 1·75 mm.

Animal unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—South Island: Mount Somers, on limestone cliffs, type (Haast): St. Helens Station, Amuri (F. Suter); Akaroa; Riccarton Bush, Christchurch (H. S.); Waitaki (Captain Hutton); Albury Rocks (W. W. Smith).

23. Laoma Hamiltoni, Suter, 1896. Plate 10, figs. 11, 11*a*, 11*b*.

Laoma (*Phrixgnathus*) *Hamiltoni*, Suter, P. Mal. S., ii, 1896, 37, pl. 4, f. 22–24.

Shell minute, subdiscoidal, narrowly umbilicated, corneous, glossy, pellucid, smooth. *Sculpture :* The protoconch is microscopically spirally lirate, but the following whorls have only distinct growth-lines. *Colour* uniformly yellowish-horny. *Spire* but little elevated. *Protoconch* of 1½ whorls, flatly convex. *Whorls* 3½, slowly and regularly increasing, convex ; periphery and base rounded. *Suture* much impressed. *Aperture* oblique, rotundly lunate. *Peristome* straight, acute, regularly rounded. *Columella* short, vertical. *Inner lip* expanded above. *Umbilicus* deep, open, about one-eighth of the greatest diameter of the shell.

Diameter—Maj., 2·5 mm. ; min., 2 mm. : height, 1·25 mm.

Animal unknown.

Type in my collection.

Hab.—Macquarie Island (A. Hamilton).

24. Laoma liratula, Suter, 1909. Plate 30, fig. 1.

Laoma (*Phrixgnathus*) *liratula*, Sut., P. Mal. S., viii, 1909, 262, pl. 11, f. 26.

Shell very small, turbinate, perforate, corneous, with radial brown streaks, not shining, thin, periphery keeled. *Sculpture* consisting of very fine dense oblique growth-striæ and very distinct microscopic spiral lines, which are finer and closer together on the protoconch. *Colour* corneous, with rather regular broad radial brown streaks, sometimes coalescing on the body-whorl ; they are faint or absent upon the base. *Spire* conoidal, its outlines almost straight, height the same as that of the aperture. *Protoconch* convex, of 1½ turns. *Whorls* 5, regularly increasing, lightly convex ; periphery keeled, base rounded. *Suture* impressed. *Aperture* lunate, oblique. *Peristome* thin and sharp, strengthened inside by a thin callosity. *Outer lip* sharply angled. *Columella* short, vertical, almost straight. *Inner lip* expanded. *Perforation* moderate, about one-eighth of the greatest diameter, deep and quite open.

Diameter, 4·2 mm. ; height, 3 mm.

Animal unknown.

Type in my collection.

Hab.—New Zealand, exact locality unknown (collected by the late Mr. C. Traill).

Remarks.—The rather wide and open perforation separates it from its near congener *L. Cheesemani*.

25. Laoma marginata, Hutton, 1883. Plate 10, figs. 4, *a*, *b*.

Phrixgnathus marginatus, Hutt., T.N.Z.I., xv, 1882 (1883), 137 ; xvi, 196.
Laoma marginata, Hutt., Man. Conch. (2), viii, 60, pl. 23, f. 94–96.
L. (*Phrixgnathus*) *marginata*, Hutt. : Hedley and Suter, P.L.S. N.S.W. (2), vii, 647 ; Suter, J. de Conch., xli, 278.

Shell minute, conical, openly perforated, finely striated, thin, semitransparent, sharply keeled, horny with radial brown bands.

Sculpture: Protoconch distinctly spirally striated; on the following whorls these microscopic spirals are obsolete, but distinct again on the base; growth-lines oblique, rib-striate. *Colour* pale corneous, regularly radially banded with reddish-fulvous, the bands becoming obsolete near the mouth and upon the base. *Spire* conical, slightly acute, somewhat higher than the aperture; outlines concave. *Protoconch* of 1½ whorls, rather large, globular. *Whorls* 5½, flattened; periphery sharply keeled, base slightly convex. *Suture* margined, not deep. *Aperture* vertical, rhomboidal. *Peristome* thin, the outer and inner margins subparallel. *Outer lip* sharply angled. *Columella* short, vertical. *Inner lip* slightly reflected. *Perforation* rather narrow, deep and open, about one-tenth of the greatest diameter of the shell.

Diameter—Maj., 3·75 mm.; min., 3·25 mm.: height, 2·5 mm.

Animal small, eye-peduncles long, the tentacles moderate; body elongate, foot slightly produced behind beyond the shell. Colour pale-yellowish; peduncles, a stripe on each side of the head, and another short stripe in the middle on each side of the foot purplish-grey (Hutton.)

Dentiton.—Hutton, T.N.Z.I., xvi, 168, pl. 9, f. S.

Jaw arcuate, not tapering, papillate, with about 28 broad plaits.

Radula having the formula 35 + 1 + 35; teeth normal.

Type in the Canterbury Museum, Christchurch.

Hab.—South Island: Greymouth (Helms).

26. **Laoma microreticulata**, Suter, 1890. Plate 30, fig. 2.

Hyalina microreticulata, Sut., T.N.Z.I., xxii, 1889 (1890), 227, pl. 15, f. 13, *a*, *b*. *Laoma microreticulata*, Sut., Man. Conch. (2), viii, 63, pl. 23, f. 13-15. *L.* (*Phrixgnathus*) *microreticulatus*, Sut.: Hedley and Suter, P.L.S. N.S.W., (2), vii, 648; Suter, J. de Conch., xli, 280.

Shell minute, depressed, corneous, openly perforate, very thin, shining, pellucid. *Sculpture* of the post-nuclear whorls consisting of fine growth-striæ, reticulated by microscopic fine spiral lines. *Colour* horny-fulvous. *Spire* conoidal, its height equal to that of the aperture; outlines lightly convex. *Protoconch* convex, of 1½ smooth turns. *Whorls* 5, rounded, regularly increasing; periphery and base convex. *Suture* impressed. *Aperture* oblique, rotundly lunate. *Peristome* straight, acute, margins faintly convergent. *Columella* short, vertical. *Inner lip* somewhat expanded. *Perforation* narrow, deep, open.

Diameter, 1·7 mm.; height, 1·3 mm.

Dentition.—Suter, T.N.Z.I., xxvi, 130, pl. 17, f. 22, 23.

Jaw composed of about 18 separate, slightly papillate plaits.

Radula with the formula 27 + 1 + 27; central tooth unicuspid, laterals and marginals bicuspid, the last exceptionally tricuspid.

Type in my collection.

Hab.—North Island: Waitakerei Range (H. S.); Hunua Range (Major Broun); Mount Pirongia (Urquhart); Waimarama (A. Hamil-

ton); Forty-mile Bush, type (H. S.). South Island: Hooker Valley (H. S.); Dunedin; The Nuggets, Port Molyneux (A. Hamilton).

The shell is mostly found in mould in the native bush.

27. Laoma Moellendorffi, Suter, 1896. Plate 10, figs. 10, *a*, *b*.

Laoma (*Phrixgnathus*) *Moellendorffi*, Suter, P. Mal. S., ii, 1896, 37, pl. 4, f. 19–21.

Shell minute, depressed turbinate, horny streaked with rufous, smooth, moderately perforate, very thin, semitransparent, faintly glossy. *Sculpture* microscopic; the post-embryonic whorls with exceedingly fine oblique growth-lines, decussated by spiral lines. *Colour* pale-horny with irregular radiate streaks of chestnut. *Spire* broadly conoidal, its height less than that of the aperture; outlines convex. *Protoconch* of $1\frac{1}{2}$ whorls, flatly convex, smooth. *Whorls* 4, regularly increasing, lightly convex; periphery distinctly angled, base rounded. *Suture* impressed. *Aperture* transverse, lunate. *Peristome* straight, acute. *Outer lip* angled. *Columella* subvertical. *Inner lip* callous and lightly reflexed. *Perforation* about one-sixth of the greatest diameter, deep, open.

Diameter, 2·5 mm.; height, 1·5 mm.

Animal unknown.

Type in my collection.

Hab.—North Island: Helena Bay; Waiwera (H. S.); Wade; Mount Wellington lava-fields, type (H. S.): Waiheke Island (H. S.).

Exemplum **sinistrorsum**, Suter, P. Mal. S., vi, 157.

Near Cowes Bay, Waiheke Island, I found a beautifully developed sinistral specimen of this species. The growth-lines are much more oblique, the circumference slightly oval, and the last whorl descending; the specimen has 4 whorls, the diameter being 3·25 mm.

28. Laoma Phrynia, Hutton, 1883. Plate 9, figs. 23, *a*, *b*.

Phrixgnathus Phrynia, Hutt., N.Z.J.S., i, 1883, 476; T.N.Z.I., xvi, 177, 197. *Laoma Phrynia*, Hutt., Man. Conch. (2), viii, 61, pl. 23, f. 88–90. *L.* (*Phrixgnathus*) *Phrynia*, Hutt.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 649; Suter, J. de Conch., xli, 279. *Phrixgnathus acanthinulopsis*, Suter, T.N.Z.I., xxiii, 92, pl. 18, f. 11.

Shell minute, conoidal, umbilicated, epidermis plicated, horny with rufous streaks, thin, semitransparent, lightly shining. *Sculpture* of the post-nuclear whorls consisting of distant retractive membranous riblets, about 5 per millimetre, very often rubbed off; the interstices with fine growth-lines, crossed by obsolete spirals, which, however, become more distinct on the base. *Colour* pale-horny, radiately streaked with rufous. *Spire* conoidal, of the same height as the aperture; outlines lightly convex. *Protoconch* convex, of $1\frac{1}{2}$ smooth turns. *Whorls* 5, convex; periphery lightly angled, base

rounded, funicular around the umbilicus. *Suture* impressed. *Aperture* somewhat oblique, rotundly lunate. *Peristome* thin, straight, the margins approximating. *Outer lip* subangled. *Columella* vertical, slightly arcuate. The *inner lip* slightly expanded. *Umbilicus* narrow, open, deep, about one-ninth of the greatest diameter.

Diameter—Maj., 2·5 mm.; min., 2·25 mm.: height, 2·25 mm.

Dentition.—Suter, T.N.Z.I., xxiii, 92, pl. 18, f. S, T.

Type in the Canterbury Museum, Christchurch.

Hab.—North Island: Wanganui, type (T. W. Kirk); Whangarei; Chicken Island (C. Cooper); Hokianga; Waitakerei Range; Hunua Range; Tarukenga; Waimarama; Seventy-mile Bush; Wade; Mount Pirongia. South Island: Kenepuru; Nelson; Stonyhurst; Hooker Valley; The Nuggets, Port Molyneux.

Var. major, Suter, P. Mal. S., ii, 1897, 259.

Differs from the species principally in the much larger size, the diameter being 3·5 mm. The epidermis is almost smooth, but the rather distinct radiate riblets are clearly visible near the suture, only rarely extending thread-like over the surface of the whorl to the periphery. The colour is darker than in most examples of the species.

Type in my collection.

Hab.—Half-moon Bay, Stewart Island (A. Hamilton).

29. **Laoma regularis**, Pfeiffer, 1855. Plate 30, fig. 3.

Helix regularis, Pfr., P.Z.S., 1854 (1855), 50; Conch. Icon., vii, pl. 182, f. 1259; M.H. Viv., iv, 33; Hector, Cat. Land Moll. N.Z., 7; M.N.Z.M., 17; Man. Conch. (2), iii, 37, pl. 21, f. 12. *Nanina* (*Thalassia*) *regularis*, Pfr., Nomencl. Hel. Viv., 47. *Phrixgnathus regularis*, Pfr.: Hutton, T.N.Z.I., xvi, 197. *Laoma* (*Phrixgnathus*) *regularis*, Pfr.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 648; Suter, J. de Conch., xli, 277.

Shell small, regularly coniform, perforate, thin, pellucid, viscously glossy, with membranous radial riblets and processes at suture and keel of periphery. *Sculpture:* Post-nuclear whorls with distant oblique membranous riblets, about 2 per millimetre, which are produced into spoon-shaped horny processes at the suture and keel of the last whorl; interstices with very fine growth-striæ, crossed by spiral lines which are distinct on the base only. *Colour* luteous-horny. *Spire* high, conic, rather acute, about three times the height of the aperture; outlines almost straight. *Protoconch* convex, of 2 smooth volutions. *Whorls* 6 to 8, flattish, slowly increasing, the last with a subacute keel; base flat. *Suture* not much impressed. *Aperture* depressed, subangularly lunate. *Peristome* simple, straight, margins remote, sharply angled where outer and basal lip meet. *Columella* very short, arcuate. *Inner lip* thin, dilated above. *Perforation* narrow, about one-tenth of the greatest diameter, deep, usually quite open.

Diameter, 3 mm. ; height, 3 mm. (type, with 6 whorls). Diameter. 4 mm. ; height, 4 mm. (specimen with 8 whorls).

Dentition.—Hutton. T.N.Z.I., xvi. 168, pl. 11, f. D.

Jaw arcuate, papillate, with about 23 broad plaits.

Radula having the formula 27 + 1 + 27 ; teeth normal.

Type in the British Museum.

Hab.—North Island : Thames (Adams) ; Toko, near Stratford ; Mount Egmont, 3,000 ft. to 4,500 ft. (Murdoch) ; Forty-mile Bush (H. S.). South Island : Kenepuru ; Greymouth (Helms) ; Riccarton Bush (H. S.).

30. **Laoma serratocostata,** Webster. 1906. Plate 30, fig. 4.

Phrixgnathus serratocostata, Webst., T.N.Z.I., xxxviii, 1905 (1906), 311, pl. 39, f. 4, 4*a*.

Shell of 4½ rounded whorls, horny without markings ; the limitation of the coarse protoconch is not clearly defined, but there is a 1½-whorled smooth apex ; the body-whorl has 21 flanges, wide on the periphery and rapidly diminishing towards the suture, the entire length beset with close-set hooked teeth, turned towards the apex ; the spaces between are clearly reticulated with revolving and incremental striæ ; the flanges are not continued on the base, but are represented by striæ of varying strength. Periphery bluntly angled ; columella widely reflexed above, perforation about one-twelfth of the major diameter. (Webster.)

Diameter, 1 mm. ; height, 0·75 mm.

Animal unknown.

Type in Mr. Webster's collection.

Hab.—North Island : Waiuku.

I have not seen this species.

31. **Laoma spiralis,** Suter, 1896. Plate 10, figs. 9, *a*, *b*.

Laoma (*Phrixgnathus*) *spiralis*, Suter, P. Mal. S., ii, 1896, 36, pl. 4, f. 16–18.

Shell very small, depressedly turbinate, perforate, corneous with brown streaks, dull, thin, semitransparent, membranously plaited, ciliated at the periphery. *Sculpture* of the post-nuclear whorls consisting of close-set radial oblique membranous costellæ, 5 to 6 per millimetre, produced into small ragged processes at the suture and keel of the body-whorl ; interstices with fine growth-lines, decussated by rather distant microscopic spiral liræ, more prominent on the base. *Colour* pale-horny, with somewhat irregular radiate rufous streaks, very faint on the base. *Epidermis* thin, the processes easily rubbed off. *Spire* conic, rather acute, about 1½ times the height of the aperture ; outlines straight. *Protoconch* of 1½ convex and smooth whorls, conic. *Whorls* 5, gradually increasing, flatly rounded, the last whor somewhat constricted at the suture, sharply keeled at the periphery ; base rounded. *Suture* impressed. *Aperture* transverse, squarish. *Peri-*

stome straight, acute. *Outer lip* sharply angled: *basal lip* broadly arched. *Columella* subvertical, slightly arcuate. *Inner lip* a little callous, expanded above. *Perforation* narrow, deep, open.

Diameter—Maj., 3·25 mm.; min., 2·75 mm.: height, 2 mm.

Animal unknown.

Type in my collection.

Hab.—South Island: Pelorus Sound (McMahon).

32. Laoma Trailli, Suter, 1909. Plate 30, fig. 5.

Laoma (*Phrixgnathus*) *Trailli*, Sut., P. Mal. S., viii, 1909, 261, pl. 11, f. 25.

Shell small, turbinate, perforated, corneous with light-brown zigzag lines, thin, pellucid, polished. *Seulpture:* The shell has very fine growth-lines, and obsolete microscopic spiral striæ on the base. *Colour* corneous, with very faint axial narrow brown zigzag lines, sometimes indistinct or absent. *Spire* conoidal, convex, its height the same as that of the aperture. *Protoconch* blunt, smooth. *Whorls* 6, slowly and regularly increasing, convex: periphery sharply angled, base rounded, broadly infundibular around the perforation. *Suture* impressed, very lightly and narrowly margined below. *Aperture* lunate, transverse, oblique. *Peristome* sharp, simple, with an inner white callus. *Outer lip* angled. *Columella* short, oblique. *Inner lip* expanded. *Perforation* deep, narrow, open, about one-fifth of the greatest diameter.

Diameter, 4·5 mm.; height, 3·2 mm.

Animal unknown.

Type in my collection.

Hab.—New Zealand, exact locality unknown (collected by the late Mr. C. Traill).

33. Laoma transitans, Suter, 1892. Plate 30, fig. 6.

Phrixgnathus transitans, Sut., T.N.Z.I., xxiv, 1891 (1892), 297, pl. 22, f. 40, *a*, *b*. *Laoma transitans*, Sut., Man. Conch. (2), viii, 59, pl. 23, f. 85–87. *L.* (*Phrixgnathus*) *transitans*, Sut.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 651; Suter, J. de Conch., xli, 282.

Shell small, depressed turbinate, openly perforate or subperforate, corneous with faint brown bands, smooth, periphery keeled, thin, semitransparent, faintly shining. *Seulpture:* Fine growth-lines, and obsolete microscopic spiral lines on the base. *Colour* yellowish-horny, with faint somewhat irregular radiate bands of light brown. *Spire* conoidal, apex rather obtuse, its height equal to that of the aperture; outlines convex. *Protoconch* broadly convex, smooth. *Whorls* 5 to 5½, slowly and regularly increasing, lightly convex; periphery acutely keeled, base convex. *Suture* not deep, narrowly margined, sometimes inconspicuous. *Aperture* oblique, subrhomboidal. *Peristome* thin, sharp, strongly callous within, the callosity extending far back. *Outer lip* sharply angled. *Columella* short, arcuate. *Inner lip* with a

rather stout callosity, expanded above, and sometimes partly hiding the narrow perforation, but in young specimens it is always quite open.

Diameter—Maj., 3 mm. ; min., 2·5 mm. : height, 2·5 mm.

Animal unknown.

Type in my collection.

Hab. — North Island : Parua Bay, Whangarei, type (Musson) ; Thames ; Waiwera (H. S.) ; Hunua Range (Major Broun).

4. *Group of* Laoma sciadium.

Umbilicus wide, one-fifth or more of the greatest diameter of the shell, more or less perspective.

KEY TO SPECIES.

A. Shell with radial riblets.
- *a.* Suture margined, periphery acutely keeled .. .. *sciadium.*
- *aa.* Suture simple, periphery convex or subangled.
  - *b.* Riblets 10–15 per millimetre ; periphery convex ; height of spire equal to that of the aperture ; dimensions, 1½ mm. by 1 mm. .. .. .. *lateumbilicata.*
  - *bb.* Riblets 8–10 per millimetre ; periphery convex ; height of spire lower than the aperture ; dimensions, 1¾ mm. by ¾ mm. .. .. .. *pumila.*
  - *bbb.* Riblets 5 per millimetre ; periphery subangled ; dimensions, 2 mm. by 1 mm. .. .. *raricostata.*

B. Shell without radial riblets, growth-lines only ; umbilicus perspective.
- *a.* Periphery obtusely carinated ; umbilicus nearly one-third of the diameter .. .. *Titania.*
- *aa.* Whorls sharply keeled ; umbilicus 45 per cent. of diameter, carinated .. .. *Murdochi.*

34. **Laoma lateumbilicata**, Suter, 1890. Plate 30, fig. 7.

Hyalina allochroida, var. *lateumbilicata*, Sut., T.N.Z.I., xxii, 1889 (1890), 228, pl. 15, f. 16, *a*, *b*. *Laoma allochroida lateumbilicata*, Sut., Man. Conch. (2), viii, 64, pl. 23, f. 10–12. *L.* (*Phrixgnathus*) *allochroida lateumbilicata*, Sut. : Hedley and Suter, P.L.S. N.S.W. (2), vii, 649 ; Suter, J. de Conch., xli, 281.

Shell minute, depressed globose, umbilicated, finely costate, thin, pellucid, shining, horn-colour. *Sculpture* consisting of retractive oblique riblets, 10 to 15 per millimetre ; interstices with microscopic growth-lines, reticulated by rather indistinct spiral striæ ; protoconch devoid of sculpture. *Colour* yellowish-horny. *Spire* conoidal, convex, its height the same as that of the aperture. *Protoconch* of 1½ whorls, rather large, broadly rounded. *Whorls* 5, regularly and slowly increasing, narrow, rounded ; periphery and base convex. *Suture* impressed. *Aperture* oblique, rotundly lunate. *Peristome* straight, acute, margins converging. *Columella* short, vertical. *Inner lip* a little expanded above. *Umbilicus* moderate, deep, open, about one-fifth of the greatest diameter.

Diameter, 1·5 mm. ; height, 1 mm.

Dentition.—Suter, T.N.Z.I., xxvi, 130. pl. 18. f. 24. 25.

Jaw and *radula* normal, the latter having the formula 14 + 1 + 14.

Type in my collection.

Hab.—North Island : Camel Bay ; Chicken Island (C. Cooper) ; Little Barrier Island (Adams) ; Wade ; Mount Wellington lava-fields (H. S.) ; Ohaupo (Musson) ; Tarukenga (Major Broun) ; Waimarama (A. Hamilton) ; Wanganui ; Toko, near Stratford (R. Murdoch) ; Forty-mile Bush, type (H. S.).

35. **Laoma Murdochi,** Suter, 1894. Plate 10, figs. 3. 3*a*, 3*b*.

Phrixgnathus Murdochi, Suter, T.N.Z.I., xxvi, 1893 (1894), 136, pl. 21, f. 39, *a*, *b*. *Laoma* (*Phrixgnathus*) *Murdochi*, Suter, J. de Conch., xli, 282.

Shell small, depressed conoidal, broadly umbilicated, carinated, with a projecting cord above the suture, very thin and diaphanous, waxen. *Sculpture :* The post-embryonic whorls all keeled, the keel forming a free cord above the suture, and continued on the periphery of the body-whorl ; there is also a carina margining the umbilicus ; surface with fine and close oblique radiate striæ, crossed by microscopic indistinct spiral lines. *Colour* pale-horny, the carina of the whorls with equidistant brown spots. *Spire* somewhat dome-shaped, its height equal to that of the aperture. *Protoconch* of $1\frac{3}{4}$ smooth whorls, broadly convex. *Whorls* 6, slowly and regularly increasing, flatly concave ; periphery keeled, base flattish. *Suture* superficial, hidden on the lower whorl by the projecting carina. *Aperture* squarish, diagonal. *Peristome* very thin and sharp. *Outer lip* sinuated, sharply angled on meeting the basal lip. *Columella* oblique, almost straight. *Inner lip* thin, slightly expanded above. *Umbilicus* broad and deep, perspective, 45 per cent. of the greatest diameter.

Diameter—Maj., 5·5 mm. ; min., 5·25 mm. : height, 2·5 mm.

Animal unknown.

Type in my collection.

Hab.—North Island : Rawene, Hokianga (R. Murdoch). One specimen only was found.

36. **Laoma pumila,** Hutton, 1883. Plate 9, figs. 24, *a*, *b*.

Microphysa (?) *pumila*, Hutt., T.N.Z.I., xv, 1882 (1883), 134. *Microphysa pumila*, Hutt., T.N.Z.I., xvi, 195. *Laoma pumila*, Hutt., Man. Conch. (2), viii, 63, pl. 23, f. 97–99. *L.* (*Phrixgnathus*) *pumila*, Hutt. : Hedley and Suter, P.L.S. N.S.W. (2), vii, 648 ; Suter, J. de Conch., xli, 279.

Shell minute, subdiscoidal, umbilicated, thin, translucent, scarcely shining, corneous, radially finely ribbed. *Sculpture :* The nucleus of the protoconch is smooth, but the following half-whorl is microscopically spirally lirate ; succeeding whorls with regular oblique retractive membranous riblets, 8 to 10 per millimetre, the interstices finely reticulated. *Colour* horny-brown. *Spire* slightly convex, low. *Protoconch* of $1\frac{1}{2}$ turns, lightly convex. *Whorls* 4, the last two rather

rapidly increasing, rounded ; periphery and base convex. *Suture* impressed. *Aperture* large, rather oblique, subcircular, broader than high. *Peristome* thin, regularly arched. *Columella* arcuate. *Inner lip* thin, slightly reflected. *Umbilicus* rather large, about one-fifth of the diameter of the shell, gradated, pervious.

Diameter—Maj., 1·75 mm. ; min., 1·5 mm. : height, 0·75 mm.

Animal.—Body short, eye-peduncles long and thick, tentacles short ; mantle rather posterior, enclosed ; foot narrow, without locomotive disc, pointed behind, not extending beyond the shell ; no caudal gland. Colour pale grey, eye-peduncles and a stripe on each side of the head dark sooty-brown. (Hutton.)

Dentition.—Hutton, T.N.Z.I., xvi. 166, pl. 9, f. Q ; Suter, *l.c.*, xxvi, 130, pl. 17, f. 20, 21.

Jaw composed of papillate plaits.

Radula with the formula 13 + 1 + 13 ; teeth normal.

Type in the Canterbury Museum, Christchurch.

Hab.—North Island : Whangarei ; Waitakerei Range (H. S.) ; Mount Wellington lava-fields (Musson) ; Wairangi (A. Suter) ; Waimarama ; Kaiti, Gisborne ; near Waitomo Caves (A. Hamilton) ; Napier. South Island : Nelson ; Eyreton, type (Professor Chilton) ; Christchurch ; Little River (H. S.) ; Ashburton (W. W. Smith) ; Dunedin (A. Hamilton).

Subsp. **raricostata**, Suter, 1890. Plate 30, fig. 8.

Patula raricostata, Sut., T.N.Z.I., xxii, 1889 (1890), 226, pl. 14, f. 9, *a*, *b*. *P.* (*Charopa*) *raricostata*, Sut., Man. Conch. (2), viii, 100, pl. 19, f. 22–24. *Laoma* (*Phrixgnathus*) *raricostata*, Sut. : Hedley and Suter, P.L.S. N.S.W. (2), vii, 649 ; Suter, J. de Conch., xli, 280.

Distinguished from the species by the following characters : The *shell* is very slightly larger, more solid, not shining. The radiate *riblets* are stronger and more distant, only about 5 per millimetre. The whole of the *protoconch* is smooth, and the microscopic spiral liræ are more distant. The *colour* is dark olive. The *periphery* is subangled, though sometimes very indistinctly, and the number of whorls is 4½. The *umbilicus* is a little wider, about a quarter of the diameter.

Diameter, 2 mm. ; height, 1 mm.

Type in my collection.

Hab.—North Island : Forty-mile Bush, type (H. S.) ; Waimarama (A. Hamilton). South Island : Dunedin (A. Hamilton).

37. **Laoma sciadium**, Pfeiffer, 1857. Plate 30, fig. 9.

Helix sciadium, Pfr., P.Z.S., 1857, 108 ; M.H. Viv., iv, 112 ; Hector, Cat. Land Moll. N.Z., 15 ; M.N.Z.M., 19. *Trochomorpha sciadium*, Pfr., Nomencl. Hel. Viv., 81. *Phrixgnathus sciadium*, Pfr. : Hutton, T.N.Z.I., xvi, 197. *Laoma* (*Phrixgnathus*) *sciadium*, Pfr. : Hedley and Suter, P.L.S. N.S.W. (2), vii, 650 ; Suter, J. de Conch., xli, 277.

Shell small, conoidly semiglobose, umbilicated, rather solid, striated, corneous variegated with reddish, shining, pellucid. *Sculp-*

ture of the post-nuclear whorls consisting of oblique retractive rounded radial rib-striæ, about 8 per millimetre, crossed by microscopic spiral lines, more distant and prominent on the base. *Colour* light fulvous, obscurely variegated with reddish radiate streaks, more distinct and forming rather close zigzag bands on the body-whorl. *Spire* convexly conoidal, its height equal to that of the aperture. *Protoconch* of 1½ smooth whorls, broadly rounded. *Whorls* 5½, slightly convex, regularly increasing, the periphery acutely keeled; base flattish. *Suture* prominently margined. *Aperture* slightly oblique, angularly lunate. *Peristome* simple, straight, sharply angled. *Columella* short, vertical, slightly arcuate. *Inner lip* thin and sharp, expanded above. *Umbilicus* moderate, about one-fifth of the greatest diameter of the shell, deep, gradate.

Diameter—Maj., 5·3 mm.; min., 5 mm.: height, 3 mm.

Animal unknown.

Type in the British Museum.

Hab.—North Island: Tom Bowline's Bay; Whangaroa (C. Cooper); Whangarei (Musson); Broadwood, Dargaville.

38. Laoma Titania, Hutton, 1883. Plate 30, fig. 10.

Phrixgnathus Titania, Hutt., N.Z.J.S., i, 1883, 476; T.N.Z.I., xvi, 177, 198.
Laoma Titania, Hutt., Man. Conch. (2), viii, 62, pl. 23, f. 82–84.
L. (*Phrixgnathus*) *Titania*, Hutt.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 650; Suter, J. de Conch., xli, 280.

Shell very small, globosely conoidal, umbilicated, striated, corneous with narrow brown zigzag bands, thin, pellucid, very faintly shining. *Sculpture* consisting of fine oblique retractive growth-striæ, and very faint microscopic spiral lines on the base. *Colour* pale-horny, with numerous narrow zigzag bands of light brown, extending over the base to the umbilicus. *Spire* conoidal, rather obtuse, about a quarter higher than the aperture. *Protoconch* of 1½ whorls, smooth, broadly convex. *Whorls* 5, rounded, regularly increasing; periphery obtusely carinated, base convex. *Suture* margined, distinctly canaliculate between the third and the fourth whorl. *Aperture* slightly oblique, subcircular. *Peristome* thin, the margins converging. *Outer lip* angled. *Columella* vertical, arcuate. *Inner lip* somewhat callous, lightly expanded. *Umbilicus* broad and deep, perspective, its diameter nearly one-third of the greatest diameter of the shell.

Diameter—Maj., 3·5 mm.; min., 3 mm.: height, 2·5 mm.

Animal unknown.

Type in the Canterbury Museum, Christchurch.

Hab.—Dunedin (Captain Hutton).

Remarks.—The only specimen I have seen is the type. Hutton does not mention the partly canaliculate suture in his diagnosis of the species: he very likely considered it to be an individual anomaly.

Fam. BULIMULIDÆ, Fischer

Animal having the jaw formed of folds imbricated externally and meeting at an acute angle near the base. Radula with the central tooth usually tricuspid; lateral teeth bi- or tri-cuspid, the inner cusp sometimes elongated and incurved; marginal teeth with 2 or 3 small cusps.

Shell oblong or ovoid, sometimes conoidal or turreted; aperture longer than wide; columella arcuate, not truncate anteriorly.

Genus 1. PLACOSTYLUS, Beck, 1837.

Placostylus, Beck, "Index Molluscorum," 57. Sole species: *P. bootis*, Menke (a composite of *P. fibratus* and *P. Hongii*). *Placostylus*, Martens, "Die Heliceen," 1861, 185. Type: *P. fibratus*, Martyn. *Placostylus*, Kobelt, Conchyl. Cab., ed. 2, 1891; Pilsbry, Man. Conch. (2), xiii, 19.

Shell dextral, ovate or oblong, usually perforate, protoconch with thimble-punctate whorls; terrestrial species are solid or ponderous and dark brown; arboreal forms are thin and paler or variegated with zigzag streaks; the surface is often spirally malleated or corrugated; aperture ovate or ear-shaped, frequently of a characteristic orange-red colour; the outer lip is blunt and unexpanded or reflexed, with a tendency to become abruptly narrower above; columella generally with a spiral fold, often calloused; parietal wall calloused and bearing a tooth, or simple.

Distribution.—New Guinea (one species), Solomon Islands, New Hebrides, New Caledonia, Fiji Islands, Lord Howe Island, and New Zealand.

Two very able papers on the distribution of *Placostylus*, by Charles Hedley, should be consulted—(1) "The Range of Placostylus: a Study in Ancient Geography" (P.L.S. N.S.W. (2), vii, 1892, 335); (2) "A Zoogeographic Scheme for the Mid-Pacific" (*l.c.*, 1899, 391).

1. Placostylus Bollonsi, Suter, 1908. Plate 30, figs. 11, *a*, *b*.

Placostylus Bollonsi, Suter, T.N.Z.I., xl, 1907 (1908), 340, pl. 25.

Shell large, oblong-conic, with a very obtuse apex, rimate, fairly solid, axially closely striate, brown, peristome simple. *Sculpture:* The first three whorls are finely and regularly axially costate and mostly not punctate; the third and sometimes the fourth and part of the fifth whorl are distinctly broadly plicate at the suture above; the following whorls are densely wrinkle-striate, the striæ of unequal strength, slightly oblique and crossed by distant spiral striæ, which are mostly obsolete upon the base. Some examples show a secondary axial sculpture on the fourth and fifth whorl, consisting of strongly oblique costæ, which are directed forwards, and reticulate the primary axial sculpture, forming a more or less distinct network. On the last two whorls a distinct narrow groove is margining the suture below. *Colour* yellowish-brown, with numerous narrow blackish-brown streaks

on the lower whorls; the apical whorls usually denuded and flesh-coloured; peristome white, aperture purplish-red within; a whitish narrow subsutural border is sometimes present, but it is much less conspicuous than in *P. Hongii*, and very often wanting. *Epidermis* thin, brown, slightly shining. *Spire* elevated conic, with a very blunt apex, $1\frac{1}{4}$ to $1\frac{1}{2}$ times the height of the aperture; outlines very slightly convex. *Protoconch* of 3 convex whorls, the nucleus with a raised inner carina. *Whorls* $6\frac{1}{2}$, the first few but little descending, lightly convex; base flatly rounded. *Suture* not deep, somewhat uneven, margined below on the lower whorls. *Aperture* vertical, pyriform, angled above, broadly rounded and somewhat angled toward the pillar below. *Peristome* continuous. *Outer lip* not expanded and not much thickened, rounded and smooth, rarely with very slight indications of denticles within. *Basal lip* slightly expanded, smooth or with a few indistinct notches. *Columella* oblique, lightly concave, indistinctly folded above. *Inner lip* not broad, with a well-marked rim forming the continuation of the basal lip; very rarely a few small tubercles may be found on the lower part of the parietal wall, but usually it is quite smooth. The *umbilical fissure* is always small.

Diameter, 40 mm.; height, 91 mm. (type). Diameter, 43 mm.; height, 99 mm. (largest specimen).

Egg and Embryonic Shell.—The egg is very large, elongately regularly oval, rounded at both ends, calcareous, thin, white, finely granular, with a few larger granules irregularly interspersed. Length, 18 mm.; diameter, 13 mm. The embryonic shell, of $3\frac{1}{4}$ whorls, is axially finely ribbed, and on the upper half of the last whorl the riblets are decussated by fine spiral liræ. There is a distinct narrow and open umbilicus. Diameter, 12 mm.; height, 17 mm.

Jaw arcuate, attenuated at the ends, irregularly striated by infoldings of the membrane.

Radula tongue-shaped, of about 130 transverse rows of teeth, which are nearly straight, forming a very obtuse angle, salient posteriorly. Formula of radula 20 + 30 + 1 + 30 + 20. The central tooth elongated, with a long and broad mesodont and a low and broadly rounded mesocone; usually there are 2 minute side cusps present. Lateral teeth, numbering about 30, with a very broad rounded mesodont, the mesocone short and broad; there is no endodont, but the ectodont is distinct, narrowly rounded, bearing a minute cutting-point. The marginals are narrower, and with 2 cutting-points; towards the margins they are becoming very narrow and indistinct, and it is impossible to exactly ascertain their number.

Reproductive Organs.—The male organ is very large, with the retractor muscle at its apex, and the walls very thick. The vas deferens enters near the apex, and it is free only for a very short distance at the base. The albumen-gland is large. The most remarkable feature is the absence of a receptaculum seminis, which is present in *P. Hongii*.

It therefore seems very probable that only one egg is laid after copulation.

Type in my collection.

Hab.—Big King, Three Kings Islands (Captain Bollons).

Remarks.—P. Bollonsi is distinguished from all the other species of the genus known to me by the obtuse broadly rounded apex. Interesting features are the costate, very rarely punctate, protoconch, and the loss of the spermatheca.

This species may be considered as a splendid example of the originating of a new species by isolation.

2. **Placostylus Hongii,** Lesson, 1830. Plate 48, fig. 14.

Bulimus Shongii, Less., Voy. Coq., Zool., ii, 1830, 321, pl. 7, f. 4, 5 (1826). Küster, Conch. Cab., 55, pl. 16, f. 14, 15: M.H. Viv., ii, 140; iii, 378: iv, 447: Conch. Icon., v, pl. 54, f. 159. *B. Hongii*, Less.: Lesson and Martinet, "Les Polynésiens," iv, 1884, 227. *Placostylus Shongii*, Less., Ad. G.R.M., ii, 153. *Bulimus fibratus*, Mart., Dieff. N.Z., ii, 247; not of Martyn. *B. bovinus*, Brug.: Petit, J. de Conch., 1853, 404: Crosse, *l.c.*, 1864, 124 (with var. *candida*): M.H. Viv., vi, 82; viii, 118: Hector, Cat. Land Moll. N.Z., 20. *Placostylus bovinus*, Brug., Crit. List, 13; M.N.Z.M., 14; Hutton, T.N.Z.I., xvi, 190; Hedley and Suter, P.L.S. N.S.W. (2), vii, 632; Suter, J. de Conch., xli, 236; Kobelt, Conchyl. Cab., *Placostylus*, 36, pl. 9, f. 1. *Bulimus auris-bovina*, Petit, J. de Conch., 1853, 403–5; Crosse, Revue. Zool., 1855, 82. *Placostylus Shongii*, Less.: Pilsbry, Man. Conch. (2), xiii, 22, pl. 11, f. 5–8.

Shell large, oblong-conic, imperforate or rimate, solid, yellowish-brown, somewhat shining, peristome smooth or with a few tubercles; without parietal nodule. *Sculpture:* The protoconch is finely axially wrinkle-striate, but this ornamentation is usually worn off, and the surface appears to be punctate; the succeeding whorls are smoothish, with low rounded and oblique folds, stronger below the suture, crossed by very faint distant spirals; the axial folds are mostly very well developed on the last half of the body-whorl. *Colour* varying from yellow with numerous narrow chestnut streaks to chestnut with blackish streaks; paler or denuded on the earlier whorls, and with a whitish subsutural border, denuded of epidermis; aperture scarlet within, fading to yellow in the throat, the peristome whitish at the margin. *Epidermis* thin, brown, shining, more or less rubbed off. *Spire* elongate, higher than the aperture; outlines convex. *Protoconch* obtuse, of 2 whorls, finely axially wrinkle-striate when intact, but mostly much worn and polished. *Whorls* 6½ to 7, moderately convex, the last rather rapidly increasing, and the latter part of it somewhat swollen below and obliquely produced; base rounded. *Suture* not much impressed, uneven. *Aperture* vertical, oblong-oval, angled above. *Peristome* continuous. The *outer lip* expanded, thickened and angular on its face, thickened within, and typically bearing a tubercle near the upper insertion, separated by a short interval from a low or strong flange, which may be either smooth or denticulate, and

which terminates in a strong tubercular tooth close to the base of the columella; the teeth and flange often subobsolete. *Columella* sloping, concave, sometimes indistinctly folded above, far within; parietal callus strong, smooth. Sometimes an elongate *umbilical fissure* is present.

Diameter, 38 mm.; height, 84 mm.; length of aperture, 41 mm. Diameter, 34 mm.; height, 75 mm.; length of aperture, 36 mm. Diameter, 29 mm.; height, 67 mm.; length of aperture, 32 mm.

Egg and Embryonic Shell.—The egg is rather small, white, calcareous, roundly ovate, very finely granular, lightly shining, thin and fragile; diameter, 5 mm.; length, 6 mm. Embryonic shell of 2 whorls, roundly ovate, subperforate, finely and closely radially zigzag striate; the nucleus with a distinct inner raised angle and a central elongated pit, the suture deep; aperture rotundly lunate.

Dentition.—Hutton, T.N.Z.I., xiii, 200; xiv, 152, pl. 3, f. D. O; xvi, pl. 9, f. B.

Animal and Anatomy.—Murdoch, P. Mal. S., iii, 324, pl. 16, f. 7, 8.

Animal.—Spirit specimen: The sides of body, neck, and tail black and granulated, the lines of granules somewhat irregular and sloping to the foot-margin; tail depressed and somewhat pointed; foot dull-leaden colour; ommatophores black, of medium length, genital pore a little behind the right ommatophore. Mantle with an even margin; a small fold projects from the under-surface, commencing at the respiratory aperture, and extending almost to the dorsal line; a corresponding but smaller fold occurs on the left side; respiratory and anal apertures in the cleft of the right fold. (Murdoch.)

Jaw arcuate, attenuated at the ends; membranaceous, soft, vertically striated by infoldings of the membrane, giving the jaw the appearance of being composed of many pieces.

Radula $4\frac{1}{4}$ mm. in breadth, and length about $2\frac{1}{2}$ times as much, with about 140 transverse rows of teeth. These rows are nearly straight, forming a very obtuse angle salient posteriorly. Teeth $55 + 1 + 55$, of which 28 are laterals. The central tooth has a single cusp, with rounded shoulders at its base; the cutting-point is short and broad; the base of attachment broadens posteriorly, and does not extend as far as the apex of the cutting-point; the lateral teeth are bicuspid, with the outer cusp small; there is no cutting-point on the interior cusp near the central tooth, but at about the twelfth row a small cutting-point appears; this gets larger to No. 20, then smaller again, disappearing in the marginals altogether. At about the fortieth row the central cutting-point disappears also. (Hutton.)

Alimentary System.—The buccal mass is large and muscular; a large salivary gland envelopes the œsophagus, with 2 salivary ducts emptying into the buccal cavity. The stomach passes gradually into the intestine; the latter makes a left-hand spiral turn, passes forward to the pulmonary chamber, thence back for nearly the full length of the stomach, turns abruptly to the right, and proceeds as a

straight narrow tube. The muscular system is divided into right, left, and median bands, the latter forming the powerful retractor of the buccal mass. (Murdoch.)

Pedal Gland.—This opens below the mouth; it forms a small undulating tube passing along the body-cavity, partially enveloped in a delicate tissue, which is attached to the body and terminates in the solid substance of the tail. (Murdoch.)

Genitalia.—The verge is large and muscular, with a slight contraction in its lower half; a little below this point the outer envelope or sheath separates from the verge, and forms a broad strong membrane, which is attached to the anterior portion of oviduct and adjoining body-wall. The retractor muscle is inserted at the apex, and attached distally to the dorsal body-wall, about midway between the pulmonary chamber and mantle-margin; the vas deferens forms a slender tube, the free portion short; it passes under the sheath at the point of separation, curving round, and enters the cavity of the verge a little below the apex; at this point the interior walls are strongly corrugated. The hermaphrodite gland forms 4 or 5 small lobes imbedded in the liver; hermaphrodite duct closely convoluted, and of a dark colour. Albumen-gland large, tongue-shaped; from the base of this gland proceed the uterus and prostate, whitish in colour, becoming darker in the lower portion, and thrown into several wide sacculated convolutions. The spermatheca is an oval-shaped sac attached to the oviduct by a strong membrane; it branches from the free portion as a narrow tube. (Murdoch.)

Type in the Mus. Hist. Nat., Paris.

Hab.—Northern parts of the North Island: North Cape, Cape Maria van Diemen (Dieffenbach, Gillies, &c.); Kaitaia; Mangonui; Whangaroa; Bay of Islands (Captain Cook, Gabert, Colenso, &c.); Whangamumu (Captain Bollons); Helena Bay; Whangarei; Chicken Island (C. Cooper); Poor Knights Islands (Captain Bollons).

This snail is mostly found at the roots of *Phormium*, forming regular nests, eggs and young snails in the centre, surrounded by adult specimens, and outside these there is usually a circle of dead shells (Captain Bollons). It is also found in the bush under dead leaves, and amongst *Hymenophyllum*. Its chief food seems to consist of decayed karaka-leaves, as is the case with *P. Bollonsi*.

Remarks.—The type was taken by Gabert at the cascade of Kerikeri, under trees bordering the river of the same name. It was named after the celebrated Maori chief Hongi Ika, who died at Mawhe in 1828. The first correct spelling of the name "Hongi" I found in the work of Lesson and Martinet, quoted above.

T. F. Cheeseman supplies the following information (T.N.Z.I., xxix, 354): Cape Maria van Diemen. Under the flax-bushes the rare land-shell *Bulimus bovinus* can be obtained in some numbers, although it has decreased considerably since pigs and goats were introduced.

Originally it must have existed in immense numbers, for the landward slope of the island is covered with the dead and bleached shells.

Maori.—Pupu-harakeke.

Var. **novoseelandicus**, Pfeiffer, 1862.

Bulimus novoseelandicus, Pfeiffer, Mal. Bl., viii, 149; M.H. Viv., iv, 83; Crosse, J. de Conch., 1864, 128; Hector, Cat. Land Moll. N.Z., 20; M.N.Z.M., 14. *Placostylus bovinus*, var. *neozelanicus*, Pfr.: Hutton, T.N.Z.I., xvi, 190. *P. bovinus*, var. *novoseelandicus*, Pfr.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 632; Suter, J. de Conch., xli, 237. *P. Shongii*, var. *novoseelandicus*, Pfr.: Pilsbry, Man. Conch. (2), xiii, 24. *Bulimus bovinus*, var. *candida*, Crosse, J. de Conch., xii, 1864. *Placostylus bovinus*, var. *candidus*, Crosse: Hutton, T.N.Z.I., xvi, 190; Hedley and Suter, P.L.S. N.S.W. (2), vii, 632; Suter, J. de Conch., xli, 237; Pilsbry, Man. Conch. (2), xiii, 25.

Distinguished from the species by the buff-white inside of the aperture, and the white peristome; the parietal callus also white.

Diameter, 31 mm.; height, 77 mm. (type).

Type in the K.K. Hofmuseum, Vienna.

Hab.—North Island: Whangaruru, type (Hochstetter); Whangarei; Cape Maria van Diemen; North Cape.

Subsp. **ambagiosus**, Suter, 1906. Plate 48, fig. 15.

Placostylus Hongii ambagiosus, Suter, J. de Conch., liv, 1906, 253, pl. 8, f. 1–3.

Distinguished from the species chiefly by the sometimes enormous incrassation of the peristome, the presence of concentric lamellæ and sometimes tubercles on the callus uniting the margins, and a more or less distinct parietal nodule; the outer lip with 2 sometimes very deep and prominent notches, and the aperture distinctly canaliculated above and at the base. The parietal tubercle is always present, though sometimes inconspicuous.

Diameter, 33 mm.; height, 74 mm.; length of aperture, 27 mm. (type).

Type in my collection.

Hab.—Cape Maria van Diemen, type (Lady Frances Brown); Kaitaia (R. H. Matthews).

Fam. ACHATINELLIDÆ

Helicteridæ, Fischer.

Animal having the jaw finely striated or ribbed. Teeth of radula with the teeth in oblique rows, with the base narrow, and the reflexed portion with numerous denticles; or the teeth may be in subhorizontal rows, the central tooth narrow, unicuspid, laterals bicuspid, and the marginals multicuspidate.

Shell bulimoid, dextal or sinistral.

Genus 1. Tornatellina, Beck. 1837.

Tornatellina, Beck, Index Mollusc., 1837, 80. Type: *T. trochlearis*, Beck.
Elasmatina, Petit de Saussaye, 1843.

Radula with the teeth in very oblique rows, central, lateral, and marginals all of the same type, base narrow, reflection rather broad, with numerous small denticles.

Shell oval or subtrochiform, pellucid, small; columella tortuous, truncated; parietal wall with 1 or more lamellæ; peristome simple, discontinuous.

Distribution.—Islands of the Pacific Ocean.

Key to Species.

a. Shell imperforate; spire $2\frac{1}{2}$ times the height of the aperture; columella strongly twisted .. .. *novoseelandica.*
b. Shell subperforate; spire very little higher than the aperture; columella not twisted .. .. *subperforata.*

1. **Tornatellina novoseelandica**, Pfeiffer, 1853. Plate 30, fig. 12.

Tornatellina novoseelandica, Pfr., M.H. Viv., iii, 524; P.Z.S., 1852 (1854), 149; Conch. Cab. (2), i, pt. 15, 149, pl. 18, f. 10, 11. *Tornatella novoseelandica*, Pfr.: Hector, Cat. Land Moll. N.Z., 21. *Tornatellina novoseelandica*, Pfr., M.N.Z.M., 14; Nomencl. Hel. Viv., 342. *T. neozelanica*, Pfr.: Hutton, T.N.Z.I., xvi, 191. *T. novoseelandica*, Pfr.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 660; Suter, J. de Conch., xli, 236. *Elasmatina Reclusiana*, Gray, P.Z.S., 1849, 167; not of Petit.

Shell very small, oblongly turreted, imperforate, thin, smooth, shining, corneous. There is no *sculpture* except fine oblique somewhat irregular growth-lines. *Colour* fulvous-horny. *Spire* high, turreted, about $2\frac{1}{2}$ times the height of the aperture. *Protoconch* globose, the nucleus flattish and somewhat oblique. *Whorls* $5\frac{1}{2}$, convex, regularly increasing, rounded at the base. *Suture* impressed, very narrowly margined. *Aperture* subvertical, somewhat ear-shaped. *Peristome* thin, acute. *Outer lip* broadly convex; *basal lip* acutely rounded. *Columella* strongly twisted, forming a prominent white callous fold, subtruncated below; parietal wall with a median moderate deeply entering fold.

Diameter, 1·5 mm.; height, 3·5 mm.

Animal unknown.

Type in the British Museum.

Hab.—North Island: Whangarei Heads (C. Cooper); near Auckland (Greenwood, &c.); Thames (Adams); Hunua Range (Major Broun); Waimarama.

Very often found on fronds of *Hymenophyllum*.

2. **Tornatellina subperforata**, Suter, 1909. Plate 30, fig. 13.

Tornatellina subperforata, Sut., P. Mal. S., viii, 1909, 263, pl. 11, f. 30.

Shell very small, conoidal, subperforate, thin, pellucid, shining, light corneous. The only *sculpture* consists of fine oblique growth-lines. *Colour* very light horny. *Epidermis* very thin, light brown,

very easily rubbed off. *Spire* elevated conic, a little higher than the aperture. *Protoconch* globose. *Whorls* 5, convex, the last rapidly increasing, ventricose; base rounded. *Suture* impressed, faintly and narrowly margined. *Aperture* subvertical, ovate, angled above. *Peristome* thin, sharp. *Outer lip* moderately convex; *basal lip* narrower arched. *Columella* vertical, not twisted. *Inner lip* thin, broadly reflexed above, and partly concealing the very narrow and not deep perforation; parietal wall with an entering median small lamella.

Diameter, 2·2 mm.; height, 3·5 mm.

Animal unknown.

Type in my collection.

Hab.—Whangarei, type (C. Cooper); near Auckland (H. S.); Raoul Island, Kermadec Islands (Miss Shakespear).

Tribe 2. AGNATHA.

Agnatha, Simroth, Ueber die Raublungenschnecken: Naturw. Wochenschrift, 1901, Nos. 10–12.

No jaws; the radular teeth narrow and pointed; carnivorous.

Fam. RHYTIDIDÆ, Pilsbry.

Animal with the mantle not or but very little reflected over the shell, without a caudal pore; no jaw; teeth of radula aculeate; mostly oviparous, but species are known to be ovoviviparous.

Shell heliciform or auriform, generally umbilicated, with depressed or plane spire, and simple peristome.

The family includes the genera *Rhytida*, *Paryphanta*, *Schizoglossa*, *Delos*, *Diplomphalus* and *Natalina*.

Distribution.—New Zealand, Tasmania, Australia, New Guinea, New Caledonia, Polynesia, South Africa.

KEY TO GENERA.

a. Shell of medium size; umbilicus infundibular; surface striated, rugose, or malleated; periphery convex or keeled; peristome simple, sharp .. .. RHYTIDA.

b. Shell mostly large, umbilicated or perforated; epidermis shining, sometimes coriaceous; periphery convex; epidermis extending beyond the peristome; shell sometimes flexible .. .. PARYPHANTA.

c. Shell small, rudimentary, auriform, worn on the tail of the animal .. .. SCHIZOGLOSSA.

d. Shell small, widely umbilicated, polished; whorls 3–4, rapidly increasing; periphery convex; epidermis not involving the peristome .. .. DELOS.

Genus 1. RHYTIDA, Albers, 1860.

Rhytida, Albers, "Die Heliceen," ed. 2, 1860, 89. Type: *Helix Greenwoodi*, Gray.

Animal having the neck, tail, and sides of body irregularly granular, the tail flattened and pointed, foot somewhat narrow; mantle with

3 lobes. Buccal mass very large and muscular; radula with not more than 36 teeth in a transverse row, usually much less. All the New Zealand species are oviparous.

Shell umbilicated, rather thin, but not devoid of calcareous matter, striated or rugose; spire not much raised; whorls 4 to 5, but little convex; umbilicus wide, infundibular; peristome simple, sharp.

Distribution.—New Zealand. Tasmania, Australia. New Guinea, New Caledonia.

KEY TO SPECIES.

A. Periphery of body-whorl keeled.
  a. Shell thin; periphery with a single keel . . . . . *Dunniæ.*
  aa. Shell solid; periphery with a double keel . . . . *duplicata.*
B. Periphery of body-whorl convex.
  a. Shell without microscopic spiral lines; periphery with 5 to 6 rounded spiral ribs . . . . . *Greenwoodi.*
  aa. Shell with distinct microscopic spiral lines.
    b. Protoconch smooth or with faint spirals; umbilicus and peristome brown; $3\frac{1}{2}$ whorls; dimensions, 11 mm. by $6\frac{1}{4}$ mm. . . . . *australis.*
    bb. Protoconch radially striated.
      c. Whorls $3\frac{3}{4}$; dimensions, 11 mm. by $6\frac{1}{4}$ mm. . . *Meesoni.*
      cc. Whorls $3\frac{1}{2}$ to 4; diameter more than 12 mm.
        d. Shell with broad grooves around the periphery of last whorl; colour brown to olive; dimensions, 23 mm. by 10 mm. . . . *patula.*
        dd. Shell without grooves around the periphery; colour pale yellow, sometimes with a brown band on upper surface; dimensions, $7\frac{3}{4}$ mm. by 6 mm. . . . . *citrina.*

1. **Rhytida australis**, Hutton, 1883. Plate 50, fig. 12.

Rhytida australis, Hutton, T.N.Z.I., xv, 1882 (1883), 139; xvi, 208: Hedley and Suter, P.L.S. N.S.W. (2), vii, 631: Suter, J. de Conch., xli, 286.

Shell depressed, umbilicated, rather thin, translucent, malleated, corneous. *Sculpture* of the post-embryonic whorls consists first of fine radial striæ which are gradually dying away but remain longest at the suture, and being replaced by strongly retractive oblique plaits, crossed by growth-lines and protractive plaits, producing a more or less malleated surface; there are microscopic fine and dense spiral lines present, sometimes faintly visible also on the protoconch, but always more distinct on the base, where growth-striæ predominate. *Colour* pale horny-brown, peristome and umbilicus much darker. *Epidermis* thin, shining on the base, dull above. *Spire* flatly convex, very little raised. *Protoconch* flat, of $1\frac{1}{2}$ usually smooth whorls. *Whorls* $3\frac{1}{2}$, rapidly increasing, rather flattened, periphery and base rounded. *Suture* impressed. *Aperture* oblique, oval. *Peristome* thin, sharp, oblique. *Columella* very oblique, short. *Inner lip* thin, not callous, broadly reflected above, and spreading as a very thin shining glaze over the convex parietal wall. *Umbilicus* rather narrow, infundibular, gradate, deep.

Diameter — Maj., 11 mm. ; min., 8·25 mm. : height, 6·25 mm. (type). Diameter—Maj., 14 mm. : min., 11 mm. : height, 7 mm.

Dentition (Hutton, T.N.Z.I., xvi, 167, pl. 10, f. S).—Formula of radula 16 + 0 + 16. Transverse row of teeth forming an acute angle. Teeth slender, all aculeate, smooth, increasing from the centre to the 14th, which is the largest, the outer two teeth becoming smaller again.

Type in the Canterbury Museum, Christchurch.

Hab.—Stewart Island (T. Kirk).

2. Rhytida citrina, Hutton, 1883. Plate 30, fig. 14.

Rhytida citrina, Hutton, T.N.Z.I., xv, 1882 (1883), 139 ; xvi, 208 : Hedley and Suter, P.L.S. N.S.W. (2), vii, 631 : Suter, J. de Conch., xli, 286.

Shell small, depressed, umbilicated, malleated, thin, translucent, shining. *Sculpture :* The first two whorls radially plaited, with a few distant fine spiral grooves, the following volution malleated on the upper surface, periphery and base with fine growth-lines ; microscopic dense and distinct spiral lines are present on the last whorl, becoming obsolete on the base ; a few distant spiral lines round the umbilicus. *Colour* pale yellow, sometimes with a spiral brown band on the middle of the upper portion of the whorl ; edge of peristome and umbilicus brown. *Spire* very flatly convex, apex obtuse. *Protoconch* of $1\frac{1}{2}$ turns. *Whorls* $2\frac{3}{4}$, rapidly increasing, convex ; periphery and base rounded. *Suture* impressed. *Aperture* oblique, broadly oval. *Peristome* very thin, convex. *Columella* subvertical, arcuate. *Inner lip* reflexed above. *Umbilicus* rather narrow, infundibular, deep.

Diameter—Maj., 7·75 mm. ; min., 6 mm. : height, 6 mm.

Animal pale brown, the upper surface with the peduncles and tentacles dark sooty-black, with a pale band on the top of the head ; sides of the foot marbled with sooty-black. (Hutton.)

Dentition (Hutton, T.N.Z.I., xvi, 167, pl. 10, f. R).—Radula with the formula 17 + 0 + 17. Transverse rows of teeth forming an acute angle. Teeth slender, all aculeate, smooth, increasing in size from the centre to the 15th, which is the largest ; 16th nearly as large as the 15th ; 17th much smaller.

Type in the Canterbury Museum, Christchurch.

Hab.—South Island : Greymouth, type (Helms) ; Buller River (Haast).

Remarks.—It is hardly possible that this shell can be the young of *R. patula*, because the markings on the shell, the colours of the animal, and the dentition all differ. (Hutton.)

The largest of the three type specimens is evidently not adult, and it is not easy to separate this species from *R. patula* by shell-characters alone.

3. Rhytida Dunniæ, Gray, 1840. Plate 49, fig. 11.

Helix Dunniæ, Gray, A.M.N.H. (1), vi, 1840, 317; Dieff. N.Z., 247; Revue Zool., vii, 375; Conch. Icon., vii, pl. 80, f. 425; M.H. Viv., i, 207; Hector, Cat. Land Moll. N.Z., 19; Ereb. & Terr., 1, pl. 1, f. 7; Conch. Cab. (2), i, pt. 2, pl. 127, f. 33–35; M.N.Z.M., 16. *Rhytida Dunniæ*, Gray: Hutton, T.N.Z.I., xvi, 208; Man. Conch. (2), i, 126, pl. 24, f. 73; Hedley and Suter, P.L.S. N.S.W. (2), vii, 630; Suter, J. de Conch., xli, 285.

Shell depressed, umbilicated, fuscous, keeled, granularly striated, very faintly shining, rather thin, translucent. *Sculpture* of protoconch consisting usually of a few radiate striæ and distant spiral lines; succeeding whorls with oblique elongately granular wrinkle-striæ, which are becoming smooth on the base toward the umbilicus, where a few distant interrupted spiral lines are present. *Colour* fuscous. *Epidermis* thin, dull on the upper surface, but shining on the base. *Spire* lightly elevated, obtuse, broadly convex. *Protoconch* of $1\frac{1}{4}$ turns, flatly rounded, slightly darker coloured. *Whorls* 4 to $4\frac{1}{2}$, flattened; the periphery acutely keeled; base convex, subangled around the umbilicus. *Suture* not much impressed. *Aperture* oblique, transversely oblong, laterally extended. *Peristome* simple, superior margin depressed. *Outer lip* sharply angled; *basal lip* regularly and broadly arched. *Columella* short, oblique, arcuate. *Inner lip* somewhat callous and shortly reflexed; parietal wall with a very thin polished glaze. *Umbilicus* moderate, infundibular, deep, cylindrical or slightly gradate.

Diameter—Maj., 24 mm.; min., 20 mm.: height, 11 mm. (type). Diameter—Maj., 30 mm.; min., 25 mm.: height, 16 mm. (large specimen).

Animal unknown.

Type in the British Museum.

Hab.—North Island: Whangaroa; Kamo (C. Cooper); Whangarei (Musson); Bay of Islands (Colenso); Otonga East (Hawkins); Rawene, Hokianga (R. Murdoch); Hen Island (Pycroft); Waitakerei Range (H. S.); Auckland (Gillies); Thames (Adams); Howick (Major Broun).

Var. β, Pfeiffer, 1835, M.H. Viv., iii, 160.

Rhytida Dunniæ, var. β, Man. Conch. (2), i, 126.

Shell olivaceous brown, last whorl with 5 elevated close spiral striæ below the periphery.

Hab.—North Island.

I have not seen this variety.

4. Rhytida duplicata, Suter, 1904. Plate 30, fig. 15.

Rhytida duplicata, Suter, P. Mal. S., vi, Sept. 1904, 155, f. 1–3 in text.

Shell convexly depressed, umbilicated, carinated, with a ridge above the keel. *Sculpture:* The surface of the shell is rather irre-

gularly and rugosely plicated, the plicæ, by anastomosing, forming a partial network, and inclined backward in the same direction as the incremental lines, which are at intervals more or less conspicuous on the last whorl. *Colour* most likely fuscous, but only specimens devoid of cuticle have hitherto been found. *Spire* depressed conoidal, slightly convex, obtuse. *Protoconch* slightly raised, of $1\frac{3}{4}$ whorls, finely obliquely plaited. *Whorls* $4\frac{1}{2}$, rapidly increasing, the first ones convex, the last bluntly keeled at the periphery, above which, at a distance of about 2 mm., is a revolving rib, separated from the keel by a shallow groove, and from the slightly raised ridge below the suture by a broad depression; this ridge disappears gradually on the penultimate whorl; base flatly convex. *Suture* sharply impressed, subcanaliculate near the aperture. *Aperture* obliquely transverse, subtriangular, the margins slightly approximating and united by a callus on the parietal wall. *Outer lip* sharp, slightly depressed and advancing above, angled at the periphery, and receding below. *Columella* oblique, arcuate. *Inner lip* slightly thickened and reflected. *Umbilicus* deep, infundibular, about one-third of the greatest diameter, margined by a slightly elevated ridge.

Diameter—Maj., 24 mm.; min., 20 mm.: height, 12 mm.

Embryonic shell subglobose, the upper side flat and radially plicated, with a distinct shallow umbilicus. Diameter, 3·5 mm.; height, 2·5 mm.

Animal unknown.

Type in my collection.

Hab.—Cape Maria van Diemen, type (McGahey); Te Reinga (C. Cooper).

5. Rhytida Greenwoodi, Gray, 1850. Plate 49, fig. 12.

Helix Greenwoodi, Gray, P.Z.S., 1849 (1850), 165; A.M.N.H. (2), vii, 65; Conch. Icon., vii, pl. 81, f. 434; Conch. Cab. (2), i, pt. 2, pl. 107, f. 11–13; M.H. Viv., iii, 156; Hector, Cat. Land Shells N.Z., 16; Zeitschr. f. Malak., 1850, 86; M.N.Z.M., 16. *Rhytida Greenwoodi*, Gray: Hutton, T.N.Z.I., xvi, 208; Man. Conch. (2), i, 126, pl. 24, f. 74; Hedley and Suter, P.L.S. N.S.W. (2), 630; Suter, J. de Conch., xli, 284. *Helix Gunni*, Gray, MS.

Shell convexly depressed, umbilicated, rugose, thinnish, slightly shining, fuscous. *Sculpture* consisting of radial oblique wrinkle-striæ, partly anastomosing and forming an irregular network of elongated narrow meshes; at the periphery there are usually 5 to 6 distant rounded but slightly raised spiral ribs, which are sometimes interrupted or anastomosing. *Colour* fuscous with an olive-green tinge. *Epidermis* thin, very lightly shining. *Spire* not high, obtuse, broadly convex. *Protoconch* of $1\frac{1}{2}$ radially striate turns, flattish, but slightly elevated above the next whorls. *Whorls* $4\frac{1}{2}$, rather convex, rapidly increasing; periphery narrowly rounded; base convex, sub-

angled around the umbilical funnel. *Suture* impressed. *Aperture* oblique, oblongly oval, within shining and bluish-white. *Peristome* simple, margins closely united, superior portion somewhat depressed, straight, bent backwards. *Outer lip* acutely and *basal lip* broadly rounded. *Columella* very oblique, arcuate. *Inner lip* with a moderate callus spreading over the basal lip, dilated and reflexed above; parietal wall with a very thin whitish and polished callus. *Umbilicus* funicular, moderate, deep, gradate, sometimes chestnut-coloured.

Diameter—Maj., 23·5 mm.; min., 19 mm.: height, 12 mm. (type). Diameter—Maj., 33 mm.; min., 26 mm.: height, 18 mm. (large specimen).

Dentition.—Hutton, T.N.Z.I., xvi, 167, pl. 10, f. P.

Anatomy.—Collinge, A.M.N.H. (7), vii, 1901, 66, pl. 1, f. 1–16: Murdoch, P. Mal. S., iv, 1901, 166, pl. 17, f. 5, 6; *l.c.*, v, 272.

Radula having the formula 12 + 1 + 12, varying from 9 to 12; the central tooth is sometimes wanting. Teeth robust, all aculeate, smooth, increasing from the centre to the 9th or 10th, the outer one or two much smaller.

Alimentary Canal.—The buccal mass is very large, and the muscular attachments very strong. The œsophagus enters the dorsal surface of the buccal cavity; it is a long narrow tube, enlarging to a wider cavity behind the salivary glands. These latter are 2 large glands, fused together in the median line. The other portion of the alimentary canal closely resembles that of *Helix*.

Generative Organs.—The generative orifices are distinct, the male opening about 1 mm. in front of the female orifice, and they are about 11 mm. behind the right upper tentacle. Male organ with the retractor muscle at its apex, a prolongation or epiphallus arises from the posterior third; between this point and the insertion of the retractor muscle the verge appears folded upon itself; the interior walls of penis and epiphallus are studded with minute papillæ. The ovotestis small and imbedded in the liver, hermaphrodite duct closely convoluted, albumen-gland large. The spermatheca subcylindrical in its lower portion, thence somewhat contracted and twisted upon itself, slightly enlarging above, and closely adhering to the uterus.

Type in the British Museum.

Hab.—North Island: Whangaroa; Kamo (C. Cooper); Auckland, type (Greenwood); Cuvier Island (Seymour); East Island (Captain Bollons); Pukekohe (H. S.); Waikato (W. W. Smith); Mount Pirongia (Urquhart); Gisborne; Wainui, near Gisborne (A. Hamilton); Cape Kidnappers; Mangaone Cave, near Nuhaka (H. Hill); Ruatoki, Tuhoe-land (E. Best); Wanganui (Drew); Levin (R. Murdoch); Midhirst, Taranaki. Stephen Island (Captain Bollons). South Island: Lake Guyon Run, Nelson.

6. Rhytida Meesoni, Suter, 1891. Plate 50, fig. 13.

Rhytida Meesoni, Suter, T.N.Z.I., xxiii, 1890 (1891), 84, pl. 16, f. 1, *a*, *b*, A; "Nautilus," vii, 123; Hedley and Suter, P.L.S. N.S.W. (2), vii, 631; Suter, J. de Conch., xli, 286. *Paryphanta Meesoni*, Sut., P.L.S. N.S.W. (2), viii, 487.

Shell small, depressed, umbilicated, corneous, thin and fragile, pellucid. *Sculpture:* Protoconch very finely radially striated; the following whorls are minutely malleated by oblique anastomosing wrinkle-striæ, occasionally crossed by a few spiral lines: the whole shell with minute, exceedingly fine, and dense microscopic lines. *Colour* yellowish-horny, with a greenish hue: aperture slightly iridescent within. *Epidermis* thin and shining. *Spire* very little raised, flatly convex. *Protoconch* flat, of $1\frac{1}{2}$ turns. *Whorls* $3\frac{3}{4}$, convex, the last rapidly increasing, broadening toward the aperture; periphery and base convex. *Suture* impressed. *Aperture* oblique, transversely oval. *Peristome* thin and sharp. *Outer lip* advancing and lightly convex above, narrowly rounded at the periphery; *basal lip* lightly arched. *Columella* oblique, short, arcuate. *Inner lip* somewhat callous, expanded above; parietal wall with a very thin shining glaze. *Umbilicus* moderate, deep, gradate, about one-sixth of the greatest diameter.

Diameter—Maj., 11·5 mm.: min., 9 mm.: height, 6 mm.

Egg small, calcareous, white, elongately oval. Diameter, 2·3 mm.; length, 3 mm.

Radula with the formula 12+0+12; the transverse rows of teeth forming an acute angle. Teeth slender, aculeate, increasing from the centre up to the 10th, which is the largest.

Type in my collection.

Hab.—South Island: Wairoa Gorge, type (Meeson); Collingwood; Kenepuru (McMahon); Hossack Downs, Canterbury (E. Suter).

7. Rhytida patula, Hutton, 1883. Plate 49, fig. 13.

Rhytida patula, Hutton, T.N.Z.I., xv, 1882 (1883), 139; Hedley and Suter, P.L.S. N.S.W. (2), vii, 630; Suter, J. de Conch., xli, 286.

Shell depressed, umbilicated, thinnish, translucent, scarcely shining, finely malleated, dark-horny. *Sculpture:* Protoconch radially finely striated, the following whorl radiately plaited, the remainder with numerous small radiate depressions, and a few obsolete broad spiral grooves near the periphery, microscopically finely and very distinctly spirally striated. *Colour* brown to olive, yellowish at the apex; aperture light bluish-white inside. *Spire* low, broadly convex, obtuse. *Protoconch* of $1\frac{1}{2}$ whorls, flatly convex. *Whorls* $3\frac{1}{2}$ to 4, rapidly increasing, rounded, the last very large, the last quarter occupying more than half the diameter of the shell; periphery and base rounded. *Suture* impressed. *Aperture* very large, oblique, oblong-oval. *Peristome* slightly thickened. *Outer lip* somewhat depressed and advancing above, flattish, narrowly rounded at the periphery;

basal lip moderately convex. *Columella* subvertical, arcuate. *Inner lip* slightly callous, reflexed toward the umbilicus, but not covering it; parietal wall with a very thin glaze. *Umbilicus* rather narrow, slightly infundibular, deep.

Diameter—Maj., 23 mm.; min., 16 mm.: height, 10 mm.

Animal.—Foot broad, flattened, and acutely pointed behind, the margin minutely crenulated, tail extending beyond the shell; no caudal gland nor locomotive disc. Mantle subcentral, just reflexed over the peristome. Eye-peduncles separated at their bases; they and the tentacles long, stout, and cylindrical. Head, peduncles, and anterior part of the foot dark grey, closely reticulated with blue-black lines, and with scattered minute white specks; sole of the foot dark-coloured: mantle under the shell pale yellow, with blotches of blue-black. (Hutton.)

Dentition (Hutton, T.N.Z.I., xvi, 167, pl. 10, f. Q).—Transverse rows of teeth forming an acute angle. Formula 18+0+18; in specimens from Balclutha 14+0+14. Teeth robust, aculeate, increasing from the centre up to the 17th, which is the largest and has an angular ridge.

Type in the Canterbury Museum, Christchurch.

Hab.—South Island: Greymouth, type (Helms); Capleston, near Reefton (Cavell); Balclutha (Captain Hutton).

Genus 2. PARYPHANTA, Albers, 1850.

Paryphanta, Albers, "Die Heliceen," 1850, 129. Type: *Nanina Busbyi*, Gray. *Paryphanta*, W. T. L. Travers, "Notes on the Larger Species of Paryphanta in New Zealand," T.N.Z.I., xxvii, 224.

Animal having the body much wrinkled, the foot capable of great extension laterally, rounded in front, pointed posteriorly, without caudal mucous pore. There are no mantle-lobes, but 2 small neck-lappets, the left in 2 lobes, one next the respiratory orifice, the other on the posterior side. Ommatophores long and rather slender, the eyes on the dorsal side some distance back from the terminal bulb. Mouth and buccal mass very muscular, the radula long and narrow. Radula with aculeate teeth, 29 to 135 in a transverse row; a central tooth is usually present. Reproductive organs simple. All the New Zealand species are oviparous, the eggs calcareous. Animal carnivorous.

Shell umbilicated, rarely perforated, the epidermis shining, sometimes coriaceous; spire flattish; suture distinct; whorls 4 to 5, rapidly increasing, the last rounded, deflexed in front; aperture lunate to elongately oval; peristome acute, sometimes enveloped by the epidermis, which usually extends beyond the peristome; columella arcuate, shortly reflexed above.

Distribution.—North and South Islands of New Zealand (six species), Tasmania (one species), Victoria (one species), Louisiade Archipelago (one species), British New Guinea (two species).

KEY TO SPECIES.

A. Shell broadly umbilicated.
  a. Upper surface with faint or obsolete spiral sculpture, sometimes wanting.
    b. Whorls 3–4, rapidly increasing, blackish-olive, no colour-markings .. .. *Edwardi.*
    bb. Whorls 5–6, slowly increasing.
      c. Shell pliable; chestnut with yellow spiral lines .. *Gilliesi.*
      cc. Shell not pliable; luteous with radial bands of darker .. .. *lignaria.*
  aa. Upper surface finely decussated, the spirals very distinct.
    b. Whorls 4½, rapidly increasing, uniformly deep green .. *Busbyi.*
    bb. Whorls 5–6, slowly increasing, fulvous to chestnut, with darker spiral bands .. .. *Hochstetteri.*
B. Shell perforated, rather small; whorls 3, rapidly increasing, with distant spiral striæ .. .. *urnula.*

1. Paryphanta Busbyi, Gray, 1840. Plate 48, fig. 10.

Helix Busbyi, Gray, A.M.N.H. (1), vi, 317; Dieff. N.Z., 246; Férussac, Hist. Nat. Moll., pl. 102, f. 19, 20; Conch. Icon., vii, pl. 73, f. 380; Ereb. & Ter., pl. 1, f. 4; Conch. Cab. (2), i, pt. 2, 328, pl. 130, f. 1–3. *Nanina Busbyi*, Gray: Shuttleworth, Notitiæ, Heft 2, pl. 1, f. 1. *Helix* (*Paryphanta*) *Busbyi*, Gray: Hector, Cat. Land Moll. N.Z., 3. *Paryphanta Busbyi*, Gray, Man. Conch. (1), i, 127, pl. 26, f. 23, 24; P.L.S. N.S.W. (2), ii, pl. 20, f. 6 (animal); M.N.Z.M., 21; Hutton, T.N.Z.I., xvi, 207; Hedley and Suter, P.L.S. N.S.W. (1), vii, 629; Suter, J. de Conch., xli, 286.

Shell large, broadly umbilicated, depressed, subdiscoidal, opaque, deep green, shining. *Sculpture:* Nucleus with oblique and arcuate radial plaits, the succeeding two whorls distinctly rugose; on the post-embryonic whorls more or less distinct spiral cords appear, which are first directed upwards, but become spiral on the last whorl; they are distant, low, broadly rounded, varying in number from about 5 to 10, and absent on the base; there are retractive distant growth-plications, which are prominently and closely plicate at the suture; the whole surface of the shell is microscopically decussated by exceedingly fine and dense radiate and spiral lines, the latter slightly wavy. *Colour* deep green, usually with some radial streaks of blackish-green; aperture within shining-blue. *Epidermis* thick, glabrous, shining, overhanging the peristome. *Spire* flat, very little raised, broadly convex. *Protoconch* of 2 whorls, flatly convex, the volutions rather rapidly increasing. *Whorls* 4½, rapidly increasing, the last very large, slightly convex, periphery and base rounded, the body-whorl more or less deflexed anteriorly. *Suture* well impressed. *Aperture* obliquely lunate-oval. *Peristome* simple, inflexed throughout. *Columella* very oblique, slightly arcuate, and shortly reflexed above. *Umbilicus* broad, perspective, deep.

Diameter—Maj., 66 mm.; min., 53 mm.: height, 29 mm. (type).

Embryonic shell globose, flat above, of 2 whorls, narrowed toward the base, narrowly umbilicate. Diameter, 10 mm.; height, 9 mm.

Egg calcareous, white, regularly oval, surface granular. Diameter, 11 mm.; length, 13 mm.

The *animal* is bluish-black, with the sole perhaps a shade lighter in colour. On the head and neck are a few regular rows of rugæ, somewhat quadrate in outline; on other parts of the body the rugæ appear to be oval-shaped, irregular in size, and not forming continuous rows. The mantle has a sharp even margin, and a deeply incised line or groove rather less than 2 mm. from the edge. On the underside of the mantle is the usual prominent lappet which conceals the respiratory and anal pores, and in addition to this is a long narrow fold on the left side. (R. Murdoch.)

Anatomy and Dentition (Hutton, T.N.Z.I., xiv, 153, pl. 4, f. A, L; Murdoch, *l.c.*, xxxv, 259, pl. 27, f. 2, 3).—Formula of teeth 104 $\times 50+0+50$, sometimes raised to 52, the rows forming an obtuse angle of about 130°, salient posteriorly. The teeth are aculeate, the innermost small and slender. Occasionally one of these slender spicula-like teeth is somewhat separated from the adjoining teeth, and where this occurs it gives to the row the appearance of a central tooth.

Further anatomical details were published by R. Murdoch: *t.c.*, pp. 258–62, pl. 27.

The buccal mass is enormous in size and muscular development; the œsophagus enters the buccal cavity dorsally in the anterior fourth; the salivary glands are fused together; the stomach forms a simple elongated sac. The pedal gland is long and flattish, much folded, and opening immediately below the mouth. The genital system is remarkable for the extreme reduction of the male organs, and the absence of a receptaculum seminis (as in *Placostylus Bollonsi* and *Schizoglossa*).

Type in the British Museum.

Hab.—Northern parts of the North Island: Kaitaia; Hokianga; Mangonui; Bay of Islands; Otonga East; Mania Hill, Whangarei.

Its distribution is coincident in range with the kauri forest.

Remarks.—This beautiful shell is rapidly being exterminated by the destruction of its natural haunts (the kauri forests), by bush-fires, and by rats and pigs. I have specimens which were badly scorched by fire, the epidermis blackened and partly lost, yet the animals were found to be alive. It is said that this snail is sometimes living on trees, very likely in clusters of semiparasitic plants, where it may find its natural food, earthworms. The Maori name of the shell would seem to imply the correctness of this assertion. The eggs are usually laid at the foot of large trees, underneath dead leaves. These molluscs were not eaten by the Maoris.

Maori.—Pupu-rangi.

Vernacular Name.—Kauri-snail; whistling snail.

2. Paryphanta Edwardi, Suter. 1899. Plate 48, fig. 12.

Paryphanta Edwardi, Suter, P. Mal. S., iii, 1899, 290, pl. 2, f. 22–25.

Shell fairly large, subdiscoidal, umbilicated, brownish-black, submembranaceous, shining, very thin, and somewhat flexible. *Sculpture:* The embryonic shell with radiate plications, the third whorl malleated, the last somewhat irregularly obliquely radially plicated, the folds crossed at right angles by more or less distinct obliquely descending low cords: the whole surface ornamented with faint and interrupted spiral striæ. *Colour* of the first two whorls light brown, the remainder blackish-olive: aperture inside of a dark-bluish tint. *Epidermis* thin, coriaceous, shining. *Spire* low, broadly conoidal. *Protoconch* of $1\frac{3}{4}$ whorls, broadly convex. *Whorls* $3\frac{3}{4}$, rapidly increasing, the last large, flatly convex; periphery and base convex. *Suture* impressed. *Aperture* oblique, oval, but little excavated by the penultimate whorl. *Peristome* simple, thickened by the overlapping epidermis. *Columella* oblique, arcuate, but very little expanded above; parietal wall with a thin light-blue callosity. *Umbilicus* pervious, moderate, about one-eighth of the minor diameter.

Diameter—Maj., 30 mm.: min., 25 mm.: height, 20 mm.

Embryonic shell subglobose, flat above, umbilicate. Diameter, 5·25 mm.; height, 4·5 mm.

Egg calcareous, white, roundly ovate, very finely granular. Diameter, 5 mm.; length, 6 mm.

Animal a deep blue, darker laterally than on the dorsum. Mantle greyish-white, with very fine sepia markings on the collar, which is divided as in the genus *Rhytida*. Generative orifice 8·5 mm. from the right upper tentacle. Rugæ irregular, very small posteriorly. Sulci bluish-white. Peripodial groove ill defined. Foot-fringe bluish-white, finely spotted, no lineoles. Foot-sole sepia-coloured, with a tinge of blue in the median portion, not divided into median and lateral planes. (Collinge, A.M.N.H. (7), vii, 70, pl. 2, f. 22.)

Radula having the formula 26 + 1 + 26. The aculeate teeth increase in size from the centre to the margin, except the last one, which is smaller. The central tooth is short and with straight sides, the five following teeth are similar but longer, they then take on a more and more triangular shape. (Suter.)

Generative Organs.—The male organ is an almost straight tube, widening in the distal half. Vas deferens a simple tube, not convoluted, extending from the left side of the distal end of the verge to the prostatic canal. Vagina large, at its extreme distal end a short sessile receptaculum seminis. The free oviduct is very short. The common duct is a long, almost straight tube. (Collinge, *l.c.*, 70, pl. 2, f. 25.)

Type in my collection.

Hab.—Hossack Downs, Canterbury (E. Suter).

3. Paryphanta Gilliesi, E. A. Smith, 1880. Plate 48, fig. 13.

Paryphanta Gilliesi, Smith, A.M.N.H., (5), vi, 1880, 159; Hutton, T.N.Z.I., xvi, 207; Man. Conch. (2), i, 127; Hedley and Suter, P.L.S. N.S.W. (2), vii, 629; Suter, J. de Conch., xli, 288.

Shell umbilicated, thin, flexible, smooth and rather glossy, with growth-lines, and obsolete spiral striæ upon the upper surface. Dark chestnut, with spiral yellowish lines varying in number and width. *Whorls* 5 or 6, shrunken in drying, in which state the last whorl is obtusely keeled, or inflated when stuffed with cotton, not united at the suture to the preceding volution for some distance from the aperture. *Aperture* oblique, without a shelly lining. *Lip* thin, arcuate above.

Diameter, 35 mm.; height, 14 mm.

Animal unknown.

Type in the British Museum.

Hab.—Whakamarama Mountain, Collingwood; Nelson.

A specimen is also in the Dominion Museum, Wellington.

4. Paryphanta Hochstetteri, Pfeiffer, 1862. Plate 48, fig. 11.

Helix Hochstetteri, Pfr., Mal. Bl., viii, 146; M.H. Viv., v, 48; Hochstetter's "Neu Seeland," p. 434, fig. in text; English edition, p. 169. *H.* (*Paryphanta*) *Hochstetteri*, Pfr.: Hector, Cat. Land Moll. N.Z., 3. *Nanina* (*Paryphanta*) *Hochstetteri*, Pfr., Nomencl. Hel. Viv., 34. *Paryphanta Hochstetteri*, Pfr., M.N.Z.M., 22; Hutton, T.N.Z.I., xvi, 207; Man. Conch. (2), i, 127; Hedley and Suter, P.L.S. N.S.W. (2), vii, 629; Suter, J. de Conch., xli, 288; Travers, T.N.Z.I., xxvii, 224; Kingsley, T.N.Z.I., xxvii, 239; Buller, T.N.Z.I., xxvii, 670.

Shell large, depressed, umbilicated, fairly solid, irregularly plaited, shining, fulvous with brown spiral bands. *Sculpture:* Upper surface irregularly radially plicated, the plaits following the direction of the fine retractive and flexuous growth-lines, which are crossed by fine and dense spiral striæ, stronger, somewhat irregularly wavy and more or less interrupted on the last two whorls; the base smooth, polished. *Colour* fulvous or yellowish-olive, ornamented with thickly set undulating chestnut-coloured spiral lines, which show very great variability in width, disposition, and depth of colour; the umbilical tract is either yellowish or brown; aperture bluish-grey or bluish-black, the parietal callus grey or whitish, sometimes light brown. *Epidermis* rather thick, viscidly shining on the upper surface, polished on the base, extending beyond the peristome. *Spire* scarcely elevated, with the crown thin, obtuse. *Protoconch* of 2 whorls, broadly convex, very often eroded. *Whorls* 5 to 6, first rather slowly increasing, slightly convex, the last depressedly rotundate, often descending in front, rounded or subangulated at the periphery, irregularly hollowed beneath. *Suture* impressed. *Aperture* very oblique, lunar. *Peristome* somewhat inflexed, straight, advancing above. *Columella* very oblique, arcuate, slightly expanded above; parietal wall with a conspicuous callus. *Umbilicus* moderate, oblique, not pervious.

Diameter—Maj., 65 mm. ; min., 56 mm. : height, 28 mm. (type).

Embryonic shell subglobose, flat above, with radial plaits and spiral lines ; periphery and the narrowed base smooth. Umbilicus very narrow. Diameter, 6·5 mm. ; height, 5½ mm.

Egg roundly oval, one end slightly more pointed, calcareous, with a thin fulvous epidermis, surface finely granular. Diameter, 8·5 mm. : length, 10 mm.

Animal and Anatomy.—Godwin-Austen, P. Mal. S., i, 6, pl. 1, f. 1–13 ; Collinge, A.M.N.H. (7), vii, 68. pl. 2, f. 17–21 ; Godwin-Austen, A.M.N.H. (7), vii, 488 ; Murdoch, P. Mal. S., iv, 171, v, 272.

Animal when alive apparently very dark indigo-grey. There is no sign of a mucous pore. The foot below is pale grey, and is much wrinkled into folds directed centrally to where the powerful retractor muscles have their attachment ; it is produced and narrows rapidly in front, broad and rounded behind, and it evidently can be very widely and laterally extended in life, so as to be oval in form, which is still its character in the spirit specimen. There is no central area. The foot is striated above by fine equidistant grooves, united by finer cross-lines ; the first terminate in a narrow pallial groove running parallel to the edge of the foot. There are no mantle-lobes, though the mantle is no doubt recurved over the edge of the peristome in life. The neck lappets or lobes are small, the right simple, the left in two lobes. (Godwin-Austen.)

The *radula* is broad and long, the rows forming an acute angle directed backwards. Formula 67 + 1 + 67. The centre tooth is small, half the size of the following admedian teeth, and is short and straight-sided. The median teeth are long aculeate, flatter on the inner side, the points slightly bending inwards like those of swords ; there is a gradual transition to the outermost laterals, no marked change of form occurring, the teeth getting shorter until of a triangular shape. (Godwin-Austen.)

Reproductive Organs.—The male organ is elongate, simple, with the retractor muscle at the very end. The vas deferens is a long fine tube closely bound to the sides of the verge for the greater portion of its length, and entering the latter near its distal end. A spermatheca is present, arising from the free oviduct on the side toward the verge.

Type in the K.K. Hofmuseum, Vienna.

Hab.—North Island : Manawatu ; Shannon ; Levin. South Island : Near Cook Strait, on limestone mountains, 3,000 ft. to 4,000 ft. above sea (Hochstetter) ; Collingwood ; Waitapu Peak ; Pelorus Valley ; hills around Mount Stokes ; West Wanganui, 50 ft. to 60 ft. above sea-level (Kingsley) ; Picton ; Stephen Island (Captain Bollons).

Remarks.—These snails no doubt feed on earthworms, but it is most likely that they also devour native slugs (*Athoracophorus*), as they are found hibernating in rotten logs, matai by preference, where the slugs also occur. According to Kingsley, they may be found also

under the shade of hinau-trees, where they lie very close generally, in a small depression in the ground, and underneath the dry leaves and rubbish.

Brazier mentions the fact that the shells are splintered into pieces by the heat in Sydney (P.L.S. N.S.W., x, 695).

Var. **obscura**, Beutler, 1901.

Paryphanta Hochstetteri obscura, Beutler, Zool. Jahrbücher, Anat., xiv. pt. 3, 1901, 369 ; Suter, J. Mal., xii, 72 ; Travers, T.N.Z.I., xxvii, 224 ; Buller, *ibid.*, 670.

This variety differs from the species in the constantly smaller size, the dark-brown to black colour of the base, the upper surface being usually of a lighter brown tint. Whorls $5\frac{1}{2}$, the last generally rapidly descending in front. Umbilicus about the same width as in the species.

Diameter—Maj., 48 mm. ; min., 42 mm. : height, 27 mm.

Anatomy (Beutler, *l.c.*, pl. 26–29).—The formula of the radula is 59 + 1 + 59. Beutler's paper is exhaustive and excellent. He comes to the conclusion that *Paryphanta* stands nearer to *Testacella* than to *Daudebardia*, and that a relatively large shell is the primary step in the phylogenetic development of the *Pulmonata*, whilst a relatively small shell has to be considered as a secondary phenomenon. According to investigations undertaken by Collinge, there is no difference in the anatomy between this variety and the species.

Hab.—Manawatu and Waikanae districts ; Stephen Island : Collingwood district ; Takaka Valley.

Remark.—Intermediate forms occur, as was shown by Sir W. Buller.

5. **Paryphanta lignaria**, Hutton, 1888. Plate 32, fig. 12.

Paryphanta lignaria, Hutton, T.N.Z.I., xx, 1887 (1888), 43 ; xxxii, 22, pl. 2 : Proc. Acad. Nat. Sci. Philadelphia, 1894, pl. 1, f. 1–3 : Hedley and Suter, P.L.S. N.S.W. (2), vii, 629 : Suter, J. de Conch., xli, 288.

Shell large, subdiscoidal, umbilicated, rather thin and flexible, brown, shining. *Sculpture* consisting of radial plaits and growth-lines, advancing from the suture, thence strongly curved and retractive, almost straight on the base ; there are traces of fine spiral striæ on the upper surface. *Colour* yellowish-brown or luteous, irregularly banded in the direction of the growth-lines with dark reddish-brown and pale brownish-yellow ; the initial whorl pale ; aperture inside bluish-white. *Spire* slightly elevated, obtuse, its angle varying from 125° to 135°. *Whorls* 5 to $5\frac{1}{2}$, rather slowly increasing, slightly convex ; periphery and base rounded. *Suture* impressed. *Aperture* transverse, oval. *Peristome* thin, the upper margin oblique, slightly undulated near the suture. *Umbilicus* the same as in *P. Hochstetteri*.

Diameter, about 50 mm.

Animal unknown, no live specimens having been found.

Type in the Canterbury Museum, Christchurch.

Hab.—Saddle between the Mokihinui and Lyell Rivers (type); eighty to ninety miles south of Collingwood: Mount Rochfort, near Westport.

6. Paryphanta urnula, Pfeiffer, 1855. Plate 50, fig. 14.

Helix urnula, Pfr., P.Z.S., 1854 (1855), 49; Conch. Icon., vii, pl. 187, f. 1306; M.H. Viv., iv, 8; Hector, Cat. Land Moll. N.Z., 12. *Paryphanta urnula*, Pfr.: Hutton, M.N.Z.M., 22. *Rhytida urnula*, Pfr.: Hutton, T.N.Z.I., xvi, 208. *Paryphanta urnula*, Pfr., Man. Conch. (2), i, 128, pl. 26, f. 14; Hedley and Suter, P.L.S. N.S.W. (1), vii, 630; Suter, J. de Conch., xli, 287.

Shell rather small, globularly ovate, covered perforate, thin, submembranaceous, obliquely furrowed and malleated, a little shining, pellucid, fuscous. *Sculpture:* Protoconch with fine radiate striæ, the succeeding whorls with radial plaits, more or less distinctly malleated, the last whorl with broadly rounded protractive ribs and fine dense spiral lines, which are getting obsolete on the base and are absent round the perforation. *Colour* fuscous, sometimes with a greenish hue, and with faint bands of darker following the direction of the growth-lines; aperture bluish-white within. *Epidermis* fairly thick, faintly shining above, polished at the base; very often the last whorl contains very little calcareous substance, being built up by conchin only. *Spire* minute, conoidal, obtuse. *Protoconch* of $1\frac{3}{4}$ whorls, convex. *Whorls* 3, convex, very rapidly increasing, the last large, subcompressed from behind, periphery convex, base somewhat excavated. *Suture* rather deep. *Aperture* oblique, truncatedly oval, within very shining, sometimes slightly iridescent. *Peristome* simple, obtuse, subinflexed, margins approximating. *Columella* high, oblique, arcuate. *Inner lip* slightly reflexed and callous above, spreading as a thin bluish-white callus over the convex parietal wall. *Umbilicus* narrow, partly hidden by the reflection.

Diameter—Maj., 16 mm.; min., 13 mm.: height, 9 mm. (type).
Diameter—Maj., 24 mm.; min., 19 mm.: height, 17 mm. (large specimen).

Egg calcareous, white. Length, 5 mm.

Animal and Anatomy.—Murdoch, P. Mal. S., v, 270.

Radula.—Suter, T.N.Z.I., xxiv, 286, pl. 20, f. 1.

The *animal* is blue-black in colour, the anterior portion of the body being darkest. The rugæ are irregular, somewhat larger on the neck and sides than on the tail. A minute line-like groove surrounds the foot-margin. The foot is comparatively broad, with the tail acutely pointed and flattened above. The foot-sole is a dirty yellowish-white in the middle area, becoming darker around the margins. The mantle has a sharp even margin, which is of a darkish colour, and from the under-side of the mantle project to right and left small fleshy ridges or lappets. The genital pore is behind the right ommatophore, and the orifices of the male and female organs appear to be distinct.

Buccal mass large and muscular; the œsophagus enters in the anterior third, and has a small salivary duct on either side.

Radula having the formula $40 \times 14 + 1 + 14$. Teeth all aculeate, increasing in size from the middle to the last but one, the last tooth being about half the length of the foregoing tooth.

Reproductive Organs.—The male organ in its anterior half is slender, thence large and sac-like, with the retractor muscle at the posterior end. The vas deferens separates from it a little below the apex. The spermatheca, where it separates from the oviduct, is large and sac-like, thence contracted to a slender tube that follows the convolution of the uterus, to which it is attached by fine tissue. The spermatheca, elongated, somewhat flat and irregular in outline, is of sponge-like texture.

Type in the British Museum.

Hab.—Lowry Bay, Port Nicholson (Sir J. Hector); Crow's Nest, four miles north of Wellington, at about 1,000 ft. altitude (R. M. Laing); Wainuiomata (G. V. Hudson); Pohui (*fide* Hutton); Tararua Mountains (H. Hamilton).

Genus 3. Schizoglossa, Hedley, 1892.

Schizoglossa, Hedley, P.L.S. N.S.W. (2), vii, 30, Nov. 1892, 391. Type: *Daudebardia novoseelandica*, Pfeiffer. *Daudebardia*, Pfeiffer, 1862; not of Hartmann, 1821.

Shell worn on the tail, incapable of containing the body, and reduced to the function of a shield to the lungs and heart, rudimentary, paucispiral, nacreous within, columella excavated into a pit for the reception of the shell-muscle. Animal lacking rhachidian teeth. (Hedley).

Distribution.—New Zealand only.

Schizoglossa appears to me referable to that section of the *Testacellidæ* embracing its compatriots, *Rhytida*, *Delos*, and *Paryphanta*, with which the lack of rhachidian teeth and the simplicity of the genitalia allies it. Of these perhaps *Paryphanta* stands the closest. (Hedley.)

The presence or absence of the central tooth is evidently not of systematic value in the *Rhytididæ*. *Schizoglossa* is most likely a *Paryphanta* in which the shell has become much reduced. A similar relation exists between *Ranfurlya* and *Flammulina*.

1. Schizoglossa novoseelandica, Pfeiffer, 1862. Plate 30, figs. 16, *a*, *b*.

Daudebardia novoseelandica, Pfr., Mal. Bl., viii, 146; M.H. Viv., v, 10 Hector, Cat. Land Moll. N.Z., 2. Hutton, M.N.Z.M., 12; T.N.Z.I., xvi. 208. *Schizoglossa novoseelandica*, Pfr.: Hedley, P.L.S. N.S.W. (2), vii. 387, pl. 9, f. 1–3; Hedley and Suter, *ibid.*, 628; Suter, J. de Conch., xli, 288.

Shell rudimentary, auriform, thin, opaque, oval, increasing irregularly. *Sculpture:* The protoconch first smooth, then spirally grooved,

the adult volution somewhat irregularly and rather distantly spirally grooved, the grooves crossed by coarse irregular and arcuate growth-wrinkles. *Colour*, without, glossy chestnut shaded to greenish-yellow at the margin, spire tinged with reddish-brown; within, nacreous, gleaming white and purple, columellar lip white. *Epidermis* thin, polished. *Spire* quite flat. *Protoconch* of $1\frac{1}{2}$ rapidly increasing whorls, flatly convex, one-seventh of the total length, regular, well defined. *Whorls* 2, the adult half most rapidly increasing, finger-nail-shaped, descending at the suture. *Suture* deep. *Peristome* thin and sharp, the upper lip very little curved. The *outer lip* regularly rounded; *basal lip* nearly straight. *Columella* very short, subvertical. *Inner lip* thickly callous, terminating below in 1 or several minute tubercles, and spreading broadly above over the parietal wall. The *inside* of the aperture is strongly callous in the centre and towards the columella, where there is a well-impressed muscular scar of the columellar muscle; a second elongated muscle-scar is situate on the inner side of the basal lip.

Diameter, 7 mm.: length, 10 mm.; height, 2·5 mm. (type). Diameter, 19·5 mm.; length, 32·5 mm.; height, 6 mm. (very large specimen).

Animal, contracted in alcohol, is in length 20 mm.; in height and breadth, 9 mm. (the shell the size of the type). Behind the shell, situated upon the hinder half of the body, the tail slightly projects; it is flat, without a trace of a mucous gland, and bluntly pointed. The margin of the foot is produced into a slight flange. A pair of grooves running along the median line from the mantle to the muzzle define a row of small tubercles. Right and left, between this median line and the foot-edge, there may be traced 2 indistinct grooves proceeding from the mantle to the lips. Posterior to these the surface is divided into tubercles by small irregular grooves meandering outwards and downwards. The mantle has an even margin, with 2 small lappets on the under-side; the right proceeds forward from a little behind the respiratory pore, extends to almost one-third of the length of the mantle-margin, and forms a narrow fold; the left is minute, simply a rudiment, and in some specimens difficult to detect. Sole without a defined median area. Two small labial tentacles are present. Colour reddish-brown, splashed with black, darkest above; mantle and sole ashy-yellow.

Anatomy.—Hedley, P.L.S. N.S.W. (2), vii, 387, pl. 9, 10; Collinge, A.M.N.H. (7), vii, 71, pl. 2, f. 26–30; Murdoch, P. Mal. S., i, 138; iv, 169, pl. 17, f. 8–10.

Radula having the formula $26 + 0 + 26 \times 61$, the number of teeth varying from 25 to 28, with here and there a rudimentary tooth in the centre. The innermost four teeth are small and slender, then they increase rapidly in size; the 25th tooth is rather smaller than the 24th, and the 26th is minute and occasionally absent.

The *pharynx* is enormous, occupying almost the whole length of the visceral cavity.

Generative Organs.—The male organ is a short tube, and exhibits little difference from the vas deferens, except that is is slightly wider; the latter is a short tube not sharply marked off from the verge. There is no spermatheca. Albumen-gland large.

Egg white, hard-shelled, oval, coarsely granular. Length, 4 mm.; diameter, 3 mm. Mr. Murdoch found the eggs to be laid in August, and they are found principally under a good thickness of decaying fern-leaves, in little heaps of from 6 to as many as 14.

Type in the K.K. Hofmuseum, Vienna.

Hab.—North Island: Kakepuku Mountain, Waikato (Hochstetter); Wainuiomata; Toko, near Stratford (Murdoch) Ohingaiti (Preston); Cape Egmont; Wanganui; Hunterville; Great Barrier Island; Whangarei Heads (Alfred Suter). Subfossil and very large shells: Cave near Tahora, Gisborne district, together with moa-bones; Mangaone Cave, near Nuhaka, Hawke's Bay (Hamilton and Hill).

Schizoglossa has a liking for *Otoconcha*, and will eat this mollusc in preference to the common earth-worm.

Vernacular Name.—Paua-slug (Great Barrier Island).

Genus 4. Delos, Hutton, 1904.

Delos, Hutton, P.L.S. N.S.W., xxix, 1904, 461. Type: *Zonites* (?) *coresia*, Gray. *Elœa*, Hutton, T.N.Z.I., xvi, 1883 (1884), 207; not of Ziegler, 1833. *Rhenea*, Hutton, P.Z.S. N.S.W. (2), vii, 1893, 631, footnote: not of Saalmüller, 1884.

Animal having no caudal mucous pore and no jaw. Radula with aculeate teeth. Reproductive organs simple. Ovoviviparous. Carnivorous.

Shell usually small; epidermis thin, not involving the peristome; umbilicus wide or moderate; whorls few, rapidly increasing.

Distribution.—New Zealand (two species); Tasmania (*D. nelsonensis*, Braz., *D. Dyeri*, Pett.); east coast of Australia (*D. splendidula*, Pfr.); Tonga (*D. gradata*, Gould).

Key to Species.

a. Adult shell with 3 whorls; diameter, 4 mm.; radially striate, spiral lines usually indistinct .. .. *coresia.*

aa. Adult shell with 4 whorls; diameter, 7 mm.; radially strongly plaited or rib-striate, spiral lines always distinct .. .. *Jeffreysiana.*

1. Delos coresia, Gray, 1850. Plate 31, fig. 1.

Zonites (?) *coresia*, Gray, P.Z.S., 1849 (1850), 166; A.M.N.H. (2), vii, 66. *Helix coresia*, Gray, Conch. Icon., vii, pl. 132, f. 807; Pfeiffer, M.H. Viv., iii, 92; Conch. Cab. (2), i, pt. 2, 459, pl. 155, f. 23–26. *H.* (*Paryphanta*) *coresia*, Gray: Hector, Cat. Land Moll. N.Z., 10. *Paryphanta coresia*. Gray: Hutton, M.N.Z.M., 24. *Elœa coresia*, Gray: Hutton, T.N.Z.I., xvi, 207; Man. Conch. (2), i, 130, pl. 26, f. 15. *Rhenea coresia*, Gray: Hedley and Suter, P.L.S. N.S.W. (2), vii, 631; Suter, J. de Conch., 289.

Shell very small, subdiscoidal, broadly umbilicated, olive-horny, sometimes fuscous-streaked, substriated, thin, pellucid, shining. *Sculp-*

ture of the post-embryonic whorls consisting of somewhat irregular, oblique, rather close radiate striæ, crossed by indistinct spiral lines. *Colour* olive-horny, very often with fuscous radial streaks. *Epidermis* thin, transparent, polished. *Spire* slightly elevated, rather convex. *Protoconch* of $1\frac{1}{2}$ smooth and convex volutions. *Whorls* 3, rather convex, rapidly increasing, the last subdepressed, not descending anteriorly, dilated; periphery and base rounded. *Suture* impressed. *Aperture* diagonal, sublunately rotund. *Peristome* simple, thin, margins approaching, epidermis slightly inflexed. *Columella* short, oblique, slightly expanded above. *Umbilicus* wide, perspective, one-quarter of the major diameter.

Diameter—Maj., 4 mm.; min., 3·25 mm.: height, 1·7 mm. (type).

Animal and Anatomy.—Murdoch, P. Mal. S., iv, 168, pl. 17, f. 1–4.

Dentition.—Hutton, T.N.Z.I., xvi, 172, pl. 9, f. E.

The *animal* is whitish in colour, with narrow grey lines radiating to the foot-margin; tentacles darker; foot somewhat narrow, thrown into minute undulations when the animal is in motion; mantle slightly projecting over the peristome of the shell. The mouth or lips minutely crenulated; this allows for considerable distension, and permits the odontophore to be much protruded.

The *buccal mass* is large and cylindrical, the posterior end curved down and forward; the salivary gland, dark in colour, is composed of 2 lobes, but the cohesion of the two is so intimate that it may be considered a single median gland.

The *radula* has the formula $9 + 0 + 9$; the teeth, disposed in numerous transverse rows which form an obtuse angle, are all aculeate, robust, and smooth, the second one being the largest, from this outward gradually getting smaller. The absence of a central tooth leaves a wide rhachidian cleft. The radula described by Hutton has the teeth increasing in size from the first to the fifth, and then decreasing.

The *reproductive organs* are simple. Verge with the retractor muscle at the posterior end; the vas deferns enters a little below the apex, and forms a short slender tube. The spermatheca is small and pear-shaped, resting on a short narrow neck; it is situate at the posterior end of the free oviduct.

The *nervous system* is very similar to that of *Rhytida*.

Type in the British Museum.

Hab.—North Island: Parua Bay, Whangarei (Musson); Chicken Island (C. Cooper); Mokohinau Islands (Lady Brown); Little Barrier Island (Adams); Motutapu Island (A. Suter); Waiheke Island (H. S.); Hillyer's Creek; Mount Wellington lava-fields (Musson); Auckland, type (Greenwood); Hunua Range (Major Broun); Tuakau; Wairangi, Waikato (A. Suter); bush near Waitomo Caves (A. Hamilton); Tarukenga (Major Broun); Ruatahuna (E. Best); Forty-mile Bush (H. S.).

2. Delos Jeffreysiana, Pfeiffer, 1853. Plate 31, fig. 2.

Helix Jeffreysiana, Pfr., M.H. Viv., iii, 1853, 105; P.Z.S., 1852 (1854), 148; Reeve, Conch. Icon., vii, pl. 130. f. 788; Hector, Cat. Land Moll. N.Z., 13. *Paryphanta Jeffreysiana*, Pfr.: Hutton, M.N.Z.M., 24. *Elæa Jeffreysiana*, Pfr: Hutton, T.N.Z.I., xvi, 208; Man. Conch. (2), i, 129, pl. 26, f. 26. *Rhenea Jeffreysiana*, Pfr.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 631; Suter, J. de Conch., xli, 289.

Shell small, subdiscoidal, broadly umbilicated, thin, distinctly striated, luteous, pellucid, shining. *Sculpture* of the protoconch consisting of microscopic fine spiral striæ, which are continued over the following whorls, being sometimes very distinct on the base, and in addition there are radial and very irregular broadly rounded plaits, which, however, occasionally are almost equidistant and rib-like. *Colour* either uniformly luteous or with lively coloured chestnut streaks, disposed in bundles; specimens from Cape Maria are marbled with chestnut and horny. *Epidermis* thin, translucent, shining. *Spire* flatly convex, very little raised. *Protoconch* of $1\frac{3}{4}$ whorls, very little rounded. *Whorls* 4, rather convex, gradually increasing, the last depressed, not descending; periphery and base rounded. *Suture* impressed. *Aperture* slightly oblique, lunately oval. *Peristome* thin, straight and simple, margins nearly uniting. *Columella* obliquè, slightly arcuate. *Umbilicus* broad, perspective, about one-third of the minor diameter.

Diameter—Maj., 7 mm.; min., 5·75 mm.: height, 3 mm.

Dentition (Hutton, T.N.Z.I., xvi, 172, pl. 11, f. F).—Formula of radula $9+0+9$; transverse rows of teeth forming an obtuse angle. Teeth robust, aculeate, smooth, the points rounded; increasing in size from the first to the fifth and then decreasing; they are stouter than those of *D. coresia*.

Type in the British Museum.

Hab.—North Island: Cape Maria van Diemen; Whangarei (A. Suter); Little Barrier Island (Adams); vicinity of Auckland: Tuakau; Tarukenga; Mount Pirongia; bush near Waitomo Caves (A. Hamilton).

Tribe 3. ELASMOGNATHA.

The jaw with a well-developed dorsal appendage.

Fam. ATHORACOPHORIDÆ, P. Fischer.

Janellidæ, Gray.

Animal limaciform, with internal rudimentary shell, usually composed of several pieces; the mantle very small, sometimes triangular; no anterior tentacles; pulmonary chamber with tracheæ. Jaw elasmognathic. Radula with a small elongated central tooth, lateral and marginal teeth very numerous, their reflection with several denticles.

The family includes three or four genera:—

(1.) *Athorocophorus*, Gould, New Zealand.

(2.) *Aneitea*, Gray, with the following five species: *A. Graeffei*, Humbert (= *Schuettei* = *Kreffti*, Keferstein), east Australia; *A. brisbanensis*, W. Pfeiffer, Queensland; *A. hirudo*, Fischer, New Caledonia, Loyalty Islands; *A. modesta*, Crosse and Fischer, New Caledonia; *A. Macdonaldi*, Gray, New Hebrides.

(3.) *Aneitella*, Cockerell, with two species. *A. virgata*, Smith, Admiralty Islands; *A. Berghi*, Plate, New Britain.

(4.) *Parmarion*(?) *Kersteni*, von Martens, Kilimandjaro, East Africa. According to Simroth, it is still doubtful whether this species should be included in this family or not. Further anatomical investigation seems to be necessary, and it is certainly not a *Parmarion*.

Genus 1. Athoracophorus, Gould, 1852.

Athoracophorus, Gould, U.S. Expl. Exp., xii, 1852, 1. Type: *Limax bitentaculatus*, Q. & G. *Janella*, Gray, 1850; not of Grateloup, 1838. *Neojanella*, Cockerell, 1891.

Animal limaciform, convexly rounded above, depressed when at rest, gradually tapering backwards, tail without a mucous pore. Dorsal surface (notum) with a median groove, bifurcating in front and forming the head-shield, with lateral, often branching grooves; epidermis mostly granular or papillate. Mantle small, sometimes triangularly defined by grooves, situate anterior to the middle on the right side of the median furrow, and containing the pulmonary orifice; the renal orifice in front. The notum is separated from the sole by a narrow field or excavation (the hyponotum), over which the lateral grooves sometimes extend; the notum and hyponotum are separated by a ridge (perinotum). Anal orifice between mantle and perinotum. Genital orifice close to the right tentacle. Sole not divided (holopod), but spirit specimens usually show it to be divided into 2 lateral and a median field (aulacopod), the result of contraction in the preservative. The 2 tentacles are dilated at base and tip, the eyes situated in the centre of the distal end. Mouth with 2 oral lobes above, each limited by 2 frontal grooves. The shell is rudimentary, consisting mostly of several small irregular pieces, calcareous or consisting of conchin, lying free under the cutis in the dorsal sinus. Jaw elasmognathic, with a large square accessory plate above the jaw proper. Radula rolled up on the sides, folded in the centre, with a narrow elongate central tooth, and 130 to 140 transverse rows of teeth, each row with about 500 teeth with denticulate reflections. The muscles of the body show no trace of a reduced columellar muscle. Pedal gland free, with accessory glands. The cerebral ganglia are placed underneath the œsophagus.

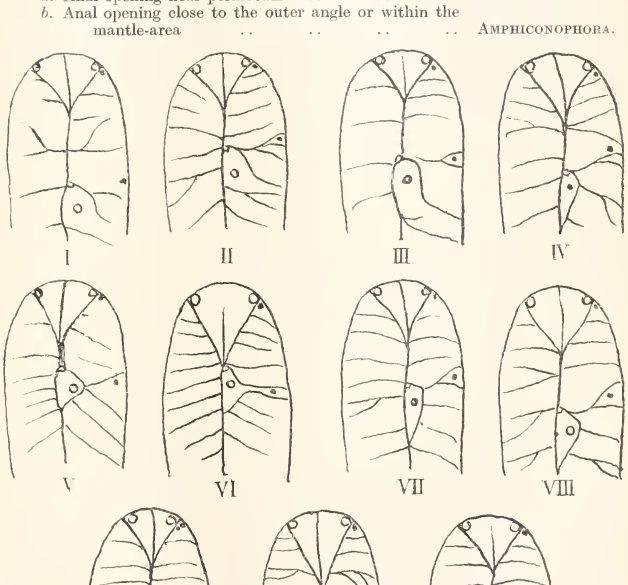
The animals live in dark and moist places, inside soft rotten wood, under dead leaves and bark, in the leaf-sheaths of nikau palms, *Astelia*, *Phormium*, &c. They most likely feed on the mycelium of fungi and decomposed vegetable substance.

Distribution.—Both islands of New Zealand; Chatham, Snares, Auckland, Campbell, and Macquarie Islands.

Key to Subgenera.

A. Mantle-area not bounded by grooves on all sides.
  a. Tentacles long, cylindrical; renal orifice inside the mantle-area .. .. Athoracophorus.
  b. Tentacles short, conical; renal orifice separated by a more or less distinct groove from the mantle-area .. .. Conophora.

B. Mantle-area with enclosing grooves on all sides.
  a. Anal opening near perinotum .. .. .. Pseudaneitea.
  b. Anal opening close to the outer angle or within the mantle-area .. .. Amphiconophora.



I. A. bitentaculatus.
II. A. bitentaculatus rufo-venosus.
III. A. marmoreus.
IV. A. Dendyi.
V. A. Huttoni.
VI. A. Martensi.
VII. A. papillatus.
VIII. A. Schauinslandi.
IX. A. Simrothi.
X. A. giganteus.
XI. A. verrucosus.

Subgen. 1. ATHORACOPHORUS, s. str.

1. Athoracophorus bitentaculatus, Quoy and Gaimard, 1832. Plate 31. fig. 3.

Limax bitentaculatus, Q. & G., Voy. Astrol., ii, 1832, 149, pl. 13, f. 1–3. *Janella bitentaculata*, Q. & G.: Hector, Cat. Land Moll. N.Z., 1; Hutton, M.N.Z.M., 27; T.N.Z.I., xvi, 206; Cockerell, P.Z.S., 1891, 217; Hedley, T.N.Z.I., xxv, 158; Hedley and Suter, P.L.S. N.S.W. (2), vii, 661. *J. maculata*, Collinge, P.Z.S., 1894, 527. *Athoracophorus bitentaculatus*, Q. & G.; Gould, U.S. Expl. Exp., xii, 2; Suter, J. de Conch., xli, 234; P. Mal. S., ii, 247, f. 1, 2 in text (teeth of radula); *l.c.*, viii, 322; Plate, Zool. Jahrb., Syst., xi, 1898, 200, pl. 19, f. 9, 13. *Neojanella dubia*, Cockerell, P.Z.S., 1891, 217; Hedley, T.N.Z.I., xxv, 159; Suter, T.N.Z.I., xxvi, 125. *Athoracophorus dubius*, Cock.: Suter, P. Mal. S., ii, 249, f. 3–9 in text (anatomy); Plate, *t.c.*, 273.

Animal elongated and rounded above when crawling, broadly ovate and flattish when resting, yellowish with irregularly scattered brownish spots, head-shield with a median groove, mantle-area not closed, anus near the perinotum. *Head* with two triangular oral lobes, approaching in the middle, from whence an oblique frontal groove ascends on each side to the outer side of the tentacles, descending again towards the base of the oral lobes. The two *tentacles* are moderately long, cylindrical, somewhat inflated at the end, where the eyes are situated. *Notum* convex, covered with minute rounded tubercles; *head-shield* not quite half the length between front and pulmonary orifice, with a median groove; *mantle-area* open on the side, the respiratory orifice near the median groove, and in front of it a small triangular area of lighter colour with the renal orifice in the median dorsal groove and behind the anterior lateral groove. *Anal orifice* below the renal and close to the perinotum; there is no preanal groove. *Generative opening* close to the outer side of the right tentacle. The *lateral grooves* number about 10 to 15 on each side, 8 to 10 of which are postpallial; they are shallow, oblique behind the mantle-area, very seldom bifurcating towards the margin. In spirit specimens the *hyponotum* is quite distinct, fairly broad, the lateral grooves passing (through contraction in alcohol) over it and partly also over the aulacopod sole; the tripartite sole is also a result of contraction only. *Perinotum* forming a thread-like ridge. *Sole* extending to the sharply pointed tail. The rudimentary *shell* is represented by about a dozen calcareous transparent oval or rounded grains of various size, the largest of about 1½ mm. diameter.

Measurements of a medium-sized spirit specimen: Length over back from head to tip of tail, 33 mm. Width of back, 10 mm. Length of sole, 31 mm.; breadth of sole, 3·5 mm. Breadth of hyponotum, 2·5 mm. Distance of anus from right tentacle, 6 mm. Distance of anus from pulmonary orifice, 5 mm. Distance of pulmonary orifice from head, 8 mm.

Anatomy.—Zeitschr. f. wissenschaftl. Zool., xv, 446, pl. 24, f. 3–5: Trans. Linn. Soc., xxii, pl. 46, f. 6–11: Semper, Reise in Arch.

Philippinen, iii, pl. 15, f. 16, 17 : Hutton, T.N.Z.I., xiv, 158, pl. 5, f. 12–16 ; xvi, 173 pl. 10, f. M : Collinge, P.Z.S., 1894. 527, f. 1 in text (*Janella maculata*) : Suter, P. Mal. S., ii, 249.

Jaw elasmognathic ; smooth, thin, broad, slightly arched, with a subquadrangular accessory plate proceeding backwards.

Radula having the formula 255 + 1 + 255. Central tooth with a simple or sinuated reflection, a median larger denticle and 2 to 3 smaller ones on each side. Lateral teeth with a broad and narrow reflection, a large inner and 5 smaller outer denticles.

Reproductive Organs.—The male organ is twisted upon itself, first a little constricted, its upper portion convoluted, opening into the long and thin vas deferens. Verge with papillæ. Retractor muscle attached to the distal end of the sheath of the male organ. The receptaculum seminis is proximal, and there is a spermoviduct.

Type in the Mus. Hist. Nat., Paris.

Hab.—North Island : Bay of Islands (Dr. Pickering) ; Thames (Adams) ; Waiheke Island (H. S.) ; Wairangi (A. Suter) ; Palmerston North (W. W. Smith) : Heretaunga ; Dannevirke ; Forty-mile Bush (H. S.) ; Wellington (Hutton). South Island : Tasman Bay (Q. & G.) ; Pelorus Valley ; Collingwood ; Greymouth ; Dunedin (H. S.).

Remarks.—The eggs are laid in small clusters sticking together ; they are oval, yellowish-white, semitransparent, their major diameter about 2 mm.

Gould states that the animals were found coiled up, a condition which no doubt is quite exceptional.

I have re-examined a number of specimens which undoubtedly represent Cockerell's *Neojanella dubia*. The central tooth of the radula I found to be always symmetrical and exactly like that of *A. bitentaculatus* on the posterior part of the radula ; sometimes, but not always, oblique or asymmetrical on the anterior part. The receptaculum seminis is mostly more proximal than the figure given by me in P. Mal. S. shows, and the shape of the verge and the size of the other generative organs may vary a good deal in the same species, as has been pointed out by Plate. We are no doubt fully justified in assuming that the specimen from the south side of Cook Strait in the British Museum, and those from Pelorus Valley in my collection, represent the typical *A. bitentaculatus*. Q. & G., which was found in Tasman Bay.

Var. antipodum, Gray, 1853.

Janella antipodarum, Gray, A.M.N.H., xii, 1853, 414 ; P.Z.S., 1853 (1854), 112. *J. bitentaculata*, Q. & G. : Collinge, P.Z.S., 1894, 528 (anatomy). *Athoracophorus antipodum*, Gray : Suter, P. Mal. S., ii, 1897, 24. *Janella antipodum*, Gray : Plate, Zool. Jahrb., Syst., xi, 272.

Distinguished from the species by the absence of spots, the animal being uniformly yellowish. The side groove descending to the anus is mostly behind it, but sometimes in front. The anatomical differences

observed by Collinge are explained by Plate, the animal of *A. antipodum* (= *bitentaculatus*, Collinge) being sexually immature.

The measurements are the same as in the species, also the jaw and radula.

Type in the British Museum.

Hab.—Forty-mile Bush; Capleston.

Subsp. rufovenosus, Suter, 1909. Plate 31, figs. 4, *a*, *b*.

Athoracophorus bitentaculatus, subsp. *rufovenosus*, Suter, P. Mal. S., viii, 1909, No. 5, 322, f. 1–3 in text.

Animal limaciform, moderately large, broad with more or less rounded tail when at rest, semicylindric with pointed tail when crawling, semitransparent, with an opaque and darker central area when alive. *Colour* yellowish, with numerous small white papillæ, median and side grooves reddish-brown, with 4 longitudinal rows of brown spots close to the side grooves; mantle-area and its neighbourhood orange; sole yellowish-white. Spirit specimens are light yellow, the grooves more or less brown, and the spots are sometimes indistinct. *Head* with two distinct oval oral lobes, tentacles cylindrical; *head-shield* extending to about midway between head and mantle-area, with a median groove. *Notum* densely covered with small papillæ, median and lateral grooves well pronounced, the latter occasionally bifurcating, their number being about 14 on each side, 10 of which are post-pallial. *Mantle-area* open on the right side, the respiratory orifice not far from the median groove, the renal opening in front of it. *Anus* on the right side, close to the perinotum, in a triangle formed by the pre- and post-anal grooves. *Generative orifice* on the outer side of the right tentacle. *Hyponotum* broad, perinotum thread-like. *Sole* aulacopod through contraction in alcohol. *Shell* rudiments consisting of about a dozen small calcareous white grains of various size and shape, the largest of about $1\frac{3}{4}$ mm.

Measurements of a large spirit specimen: Length over back from head to tip of tail, 37 mm. Width of back, 9 mm. Length of sole 33 mm.; width, 4 mm. Breadth of hyponotum, 2·5 mm. Distance of anus from right tentacle, 7 mm. Distance of anus from pulmonary orifice, 9 mm. Distance of pulmonary orifice from head, 10 mm. Distance of generative pore from pulmonary orifice, 9 mm.

Jaw elasmognathic.

Radula (fig. 4*a*) with very numerous teeth, the central tooth with a large median and 6 lateral denticles, 3 on each side. Lateral teeth with an inner large and 6 outer smaller denticles.

Reproductive Organs (fig. 4*b*).—The hermaphrodite gland is of moderate size, brownish; the albumen-gland rather large, smooth, yellowish-white; there are no accessory glands below it; the prostate above and the oviduct below are of nearly equal size; the latter is prolonged into a somewhat convoluted free oviduct with a proximal receptaculum

seminis. The sheath of the male organ is not long, oval, narrowed distally, with the retractor muscle at the bend where the vas deferens begins. The intromittant organ has papillæ inside, which will be on the outside when the organ is everted.

Type in my collection.

Hab.—North Island : Tuakau (type) ; vicinity of Auckland ; Waitakerei Range ; Stratford.

Very often found in the leaf-sheaths of nikau palms.

Remarks.—This subspecies was formerly included in *A. bitentaculatus*, and is the form mentioned by me in P. Mal. S., ii, 24, as being semitransparent, and having an orange mantle-area. It is also distinguished from the species by the brown grooves, the rows of brown spots close to the side grooves, the mantle-area limited in front and behind by a groove and open on the side, and the presence of a preanal groove.

Subgen. 2. CONOPHORA, Hutton, 1879 (em.).

Konophora, Hutton, T.N.Z.I., xi, 332. Type : *K. marmorea*, Hutt.

Slugs with the mantle-area open on the right side, the renal orifice in front of it, separated by a more or less distinct groove ; tentacles short, conical.

2. **Athoracophorus marmoreus**, Hutton, 1879. Plate 31, fig. 5.

Konophora marmorea, Hutton, T.N.Z.I., xi, 1878 (1879), 332 ; M.N.Z.M., 27. *Janella marmorea*, Hutt., T.N.Z.I., xiv, 158, pl. 5, f. 1, 2 ; xvi, 206 : Hedley and Suter, P.L.S. N.S.W. (2), vii, 662 : Plate, Zool. Jahrb., Anat., xi, 273. *Athoracophorus mamoreus*, Hutt. : Suter, J. de Conch., xli, 235 ; P. Mal. S., ii, 255 : viii. 324.

Animal elongate, the back convex, nearly smooth or finely granular, and sometimes with small and not much raised papillæ, these characters being largely dependent on the mode of preservation. I have not seen a live example, and this diagnosis is based on alcoholic specimens. The *colour* is very variable—(1) the typical form is blackish, marbled with pale brown on the back ; an indistinct black lateral line ; region round the pulmonary opening yellowish : (2) blackish-grey, with several roundish, distinctly granular patches in each side-field ; renal orifice whitish ; perinotum black ; sole dark grey : (3) back yellowish-brown with black spots along the median groove behind the mantle-area, and 2 longitudinal rows of distant round black spots on each side of the back, and a few whitish papillæ and small granules in the lateral areas ; all grooves whitish ; sole yellowish-white. Sometimes small irregularly shaped black spots are present below the perinotum. *Eye-peduncles* short and conical (*teste* Hutton). *Mouth* with 2 broad oval lobes above, separated in the middle by a more or less distinct triangular lobe. The *median groove* is very distinct, and continued on the head-shield, a character not indicated in Hutton's drawing of the

animal. *Side grooves* 12 on each side, some of them bifurcating, 6 or 7 are post-pallial. In well-preserved specimens the *notum* is finely granular, and each lateral area contains 2 to 3 small roundish papillæ, which, however, are mostly inconspicuous. The triangular *head-shield* is rather short, and does not quite reach to the middle between the head and renal orifice. *Mantle-area* bounded on the left by the median groove, in front by a lateral groove which curves backward for a short distance and then runs down to the perinotum parallel to the other lateral grooves; posteriorly there is a simple oblique groove, so that the mantle-area is quite open towards this side groove; sometimes a fine short transverse groove arises from the posterior groove, either at its origin or a little further down, imperfectly and inconspicuously closing the mantle-area. The *renal orifice* is in the median groove in front of the mantle-area, and in most specimens distinctly separated from it by a groove. The *pulmonary orifice* is subcentral in the anterior part of the mantle-area. The *anus* is below the renal orifice on the right side, close to the perinotum, and the preanal groove is the same that separates the renal opening from the mantle-area. *Genital orifice* close to the right tentacle. *Hyponotum* fairly distinct, broad; the *perinotum* usually not very conspicuous, consisting of a row of elongated tubercles. The *side grooves* are continued over the hyponotum and part of the aulacopod sole, the latter characters being the result of contraction in alcohol. *Sole* separated from the head by a deep groove, pointed behind. *Tail* rounded or tapering to a point. Twelve to sixteen minute calcareous plates form the rudimentary *shell*.

Measurements of a specimen from Dunedin: Length over back from head to tip, 30 mm. Width of back to perinotum, 15 mm. Sole—Length, 23 mm.; breadth, 4·5 mm. Breadth of hyponotum, 2 mm. Distance of anus from right tentacle, 6 mm. Distance of anus from pulmonary orifice, 5½ mm. Distance of pulmonary orifice from head, 8 mm.

Dimensions of a large specimen from Great Barrier Island: Length, 51 mm.; width, 22 mm.

Anatomy.—Hutton, T.N.Z.I., xiv, 159, pl. 5, f. 3–9.

Radula having the formula $130 \times 255 + 1 + 255$. Central tooth emarginate above, rounded below, with 7 denticles.

Reproductive organs without spermoviduct and prostate, but with accessory bulbose and glomerate glands. The receptaculum seminis is globular, with a short neck, proximal. Male organ long, narrow, and tapering, and the vas deferens enters it at its posterior extremity, where the retractor muscle is also attached. The spermatozoa are gradually thickened at one end, which is spirally twisted.

Type in the Otago Museum, Dunedin.

Hab.—Dunedin; Resolution Island; Ashburton; Great Barrier Island; Mount Hut, Tongariro district, at 3,700 ft. altitude (E. Phillips Turner).

Subgen. 3. Pseudaneitea, Cockerell, 1891.

Pseudaneitea, Cockerell, P.Z.S., 1891, 217. Type: *Athoracophorus papillatus*, Hutton.

Slugs of New Zealand and its subantarctic islands, resembling *Athoracophorus*, s. str., but showing a decided tendency towards the formation of a mantle-area like that of *Aneitea*.

These slugs are not always small. Notum usually finely granulate with larger raised tubercles or papillæ between the lateral grooves. Mantle-area distinct, triangular or rarely quadrangular, enclosing the respiratory and renal orifices. Anus near the perinotum.

Key to Species.

A. Head-shield reaching to mantle, with a shallow indistinct median groove; mantle-area narrowly open on right side; notum only wrinkled; 18 to 20 lateral grooves. . . . . *Martensi.*

B. Head-shield with distinct median groove.

a. Two large round papillæ in a post-pallial side field; 15 lateral grooves, 8 post-pallial, bi- and tri-furcate. Anus 2 mm. above perinotum. Central tooth of radula with 1 denticle. Receptaculum seminis distal. Accessory glands . . . . . *Dendyi.*

b. Five small papillæ in a post-pallial side field; 18–21 lateral grooves, 9 post-pallial, only a few bifurcate. Anus 2 mm. above perinotum. Central tooth of radula with 3 denticles. Receptaculum seminis proximal. With spermoviduct, no accessory glands . . . . *Huttoni.*

c. Six papillæ in a post-pallial side field; 20 lateral grooves, 12 post-pallial, some bifurcate. Anus close to perinotum. Central tooth of radula with 7 denticles. Receptaculum seminis proximal. Accessory glands. . *papillatus.*

d. Three to four large oval papillæ in a side field; 15 lateral grooves, 8–9 post-pallial, some bifurcate. Anus near perinotum . . . . . *Simrothi.*

e. Two to four large papillæ in a post-pallial side field; 15 lateral grooves, 7 post-pallial. Anus a little above perinotum. Central tooth of radula with 3 denticles. Receptaculum seminis distal. Accessory glands . . *Schauinslandi.*

3. Athoracophorus Dendyi, Suter, 1897. Plate 31, fig. 6.

Athoracophorus Dendyi, Suter, P. Mal. S., ii, 1897, 253, f. 12–17 in text; viii, 324. *Janella Dendyi*, Suter: Plate, Zool. Jahrb., Anat., xi, 273.

Animal (in alcohol) large, broadly elongate, with large dorsal papillæ, median groove extending over the head, side grooves bi- and tri-furcate, hyponotum very distinct. *Colour* yellowish-grey along the sides of the back, the central part blackish, but the large papillæ whitish; sole yellowish-grey. *Body* narrowing gradually towards the tail. *Notum* flatly rounded, with very conspicuous median and lateral grooves, the whole surface minutely granulate; between the lateral grooves 1 or 2 large raised round tubercles, forming a single row on each side from the mantle-area to the head, double from the mantle-area to within a short distance of the tail. *Head-shield* triangular, reaching behind to the middle of the distance between the head and

mantle-area, with a distinct median groove. *Lateral grooves* numbering about 15 on each side, 8 of which are post-pallial; towards the margins they are bi- or tri-furcating. *Mantle-area* narrowly triangular, sometimes quadrangular, granulose; the *respiratory orifice* in the middle; the *renal opening* small, in the front angle on the median groove; both orifices of a lighter colour. *Anus* below and a little in front of the respiratory orifice, a short distance above the perinotum. *Hyponotum* broad and very distinct, the lateral grooves passing over it. *Perinotum* sharply raised. *Sole* broad, smooth, with a lighter median band, and separated by a thread-like line from the hyponotum. Rudimentary *shell* consisting of calcareous white grains.

The measurements of the type specimen are: Length over back from head to tip of tail, 50 mm. Width of back, 23 mm. Sole—Length, 40 mm.; breadth, 11 mm. Breadth of hyponotum, 4 mm. Distance of anus from right tentacle, 12 mm. Distance of anus from pulmonary orifice, 9 mm. Distance of anus from perinotum, 2·5 mm. Distance of pulmonary orifice from head, 18 mm.

The elasmognathic *jaw* has the usual form.

Teeth of *radula* very numerous, the central tooth very slender, with a small, sometimes irregularly shaped cusp, bearing a single blunt denticle, usually on the left side. Lateral teeth with a long and stout inner denticle, and 3 smaller outer ones. Digestive system similar to that of *A. papillatus*.

The *reproductive organs*, which open close behind the right tentacle, have no prostata visible and no spermoviduct, but 2 accessory glands, a smaller bulbose gland below the large elongated albumen-gland, and a large convoluted glomerate gland; the receptaculum seminis is inserted distally on the vagina; the intromittant organ with numerous dense papillæ.

Type in my collection.

Hab.—South Island: Springburn, Mount Somers (Professor Dendy); slopes of Ben More, in *Fagus* forest (Dr. Hilgendorf).

4. Athoracophorus Huttoni, Suter, 1909. Plate 31, fig. 7.

Athoracophorus (*Pseudaneitea*) *Huttoni*, Suter, Subantaret. Islds. N.Zeal., i, 1909, 39, pl. 1, f. 17–19; P. Mal. S., viii, 324.

Animal (in alcohol) rather small, back rounded, tail tapering to a rather sharp point; yellowish, with 4 rows of black spots on the notum, the median part usually of darker colour, with numerous prominent papillæ, the head-shield with a median groove; anal orifice near the perinotum. The *ground-colour* is a light yellow, very likely amber when alive; on the notum there are 2 rows of dark-brown or blackish spots on each side from the median line, the inner row of larger and often coalescing spots, the outer row formed by smaller and but rarely confluent specks; the broad median area between the two inner rows is usually of a darker colour, but the mantle-area,

the median groove in front, and the papillæ are of lighter colour; there are in most specimens irregularly distributed small black spots above and below the perinotum; sole uniformly light yellow. *Head* transversely oval, separated from the sole by a deep groove; oral lobes very distinct, oval, separated by a narrow flat ridge, and limited on the inner and outer side by distinct frontal grooves. *Tentacles* retracted. *Head-shield* extending to about half-way between head and mantle, with a median groove, which is shallower than the side grooves. The *notum* is thickly covered with very prominent round papillæ, arranged in longitudinal rows, 5 in a lateral field behind the mantle, but gradually reduced from 4 to 2 in front of the mantle. The *median groove* extends nearly the whole length of the back, bifurcating on reaching the tail-tip. *Lateral grooves* narrow, slanting backwards, very seldom bifurcating towards the margin, and extending, through contraction in alcohol, over hyponotum and sole; there are about 18 to 21 grooves on each side, 9 of which are post-pallial. A distinct preanal groove is present. The *mantle* is distinctly triangular, limited by grooves; at the anterior angle and in the median groove is the *renal orifice*, covered by a small oval flap; the pulmonary orifice subcentral. The *anal opening* is on the right side below the mantle, but nearer to the perinotum. The *hyponotum* is very distinct, 2 mm. broad; the *perinotum* is also well marked, nodulous, no doubt through contraction in alcohol. *Sole* aulacopod, again the result of contraction. The *shell* is rudimentary, consisting of about 20 small white calcareous grains of various shape and size, the largest having about 1 mm. major diameter.

Measurements of largest specimen: Length over back from head to tip of tail, 28 mm. Width of back to perinotum, 16 mm. Sole—Length, 25 mm.; breadth, 7 mm. Breadth of hyponotum, 2 mm. Anal orifice 11 mm. behind the right tentacle and 2 mm. above the perinotum. Pulmonary opening 14 mm. behind the right tentacle. Genital orifice on right side of the right tentacle.

Jaw as usual in the genus, the median basal projection sharply produced, but sometimes worn off.

Radula with numerous teeth, the central tooth small and slender, with 3 small cusps and a blunt denticle on each. Lateral teeth with about 7 denticles, the 2 innermost largest.

Pedal gland long, nearly half the length of the sole, narrow, flat, thin.

Reproductive Organs.—The sheath of the male organ is rather long, convolute, narrowed toward the distal end, where the vas deferens enters and the retractor muscle is fixed; the verge armed with papillæ. There is a short vagina, with the receptaculum seminis near its proximal end. Albumen-gland large, oval, yellowish. The hermaphrodite gland is globular, large, light brown; the hermaphrodite duct not very long and convolute. No accessory glands.

Type in my collection.

Hab.—Snares, type (Captain Hutton, Dr. Colquhoun); Campbell Island (W. K. Chambers).

5. Athoracophorus Martensi, Suter, 1909. Plate 31, figs. 8, 8*a*.

Athoracophorus marmoratus (v. Mts.), Simroth, Nova Acta, Leop.-Carol. Deutsch. Akad. Naturf., liv, 1889, 71, pl. 4, f. 3–10. *Janella marmorea*, Hutt.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 662. *Athoracophorus marmoreus*, Hutt.: Suter, J. de Conch., xli. 235. *Janella marmorata*, Simroth: Hedley, T.N.Z.I., xxv, 159; Plate, Zool. Jahrb., Anat., xi, 204, 205, pl. 9, f. 12; not *Athoracophorus marmoreus*, Hutton, 1879. *Athoracophorus Martensi*, Suter, P. Mal. S. viii, 1909, 324.

Animal limaciform, with roundish cross-section, but the sole flat, yellowish with black spots scattered over the back, head-shield extending to the mantle-area, which is subtriangular and open towards the anus, situated some distance below the pulmonary orifice, but nearer to the perinotum. *Colour* yellowish, with irregularly shaped black spots scattered over the notum, but concentrated and sometimes forming large patches around the mantle-area. In all the specimens at my disposal, and preserved in alcohol, the two tentacles are retracted. *Head* with 2 oval oral lobes, touching in the middle, with 2 frontal grooves which form bifurcations of the side grooves of the head-shield; a triangular lobe in the centre above the two oval lobes. The whole of the *back* is finely wrinkled, but some specimens are nearly smooth. *Median groove* distinct from anterior part of mantle-area to near the tail; side grooves oblique, directed backwards, about 20 on the left and 18 on the right side of the notum (13, *teste* Plate), of which 9 to 10 are post-pallial; there are numbers of secondary grooves, especially on the hyponotum. *Head-shield* elongated triangular, reaching posteriorly to the renal orifice; the median groove but faintly indicated on the posterior part, and perhaps not visible on the living animal. *Mantle-field* small, triangular, but narrowly open on the right anterior side; the front groove is running transversely down to the anal orifice, forming the preanal groove, and the right posterior groove is bent down anteriorly parallel to the preanal groove, forming a post-anal groove. *Renal orifice* very distinct, in the middle line and anterior corner of the mantle-area. *Anus* below the respiratory orifice, which is in the anterior part of the mantle-area, a little nearer the perinotum than to the pulmonary opening. *Genital orifice* outside the right tentacle. *Hyponotum* rather indistinct; the *perinotum* only indicated by a low rounded ridge and a series of small black spots; the numerous transverse grooves are very prominent on the hyponotum. *Sole* of the same colour as the notum, aulacopod through contraction in alcohol. *Shell* rudimentary, consisting of irregular calcareous grains, the size being very variable; the largest are about 1 mm.; they are laying in a large semicircle, beginning above the anus and continued in front and on left side of the mantle-area, forming a large patch behind and to the left of it.

Measurements of my largest specimen: Length over back from head to tip of tail, 46 mm. Width of back, 24 mm. Sole—Length, 34 mm.; breadth, 8 mm. Breadth of hyponotum, 2 mm. Distance of anus from right tentacle, 8 mm. Distance of anus from pulmonary orifice, 6 mm. Distance of anus from perinotum, 5 mm. Distance of pulmonary orifice from head, 11 mm.

Jaw small, elasmognathic, with a broadly triangular and rounded median projection.

Radula (fig. 8*a*) with very numerous teeth. The central tooth has, according to Simroth's figure, 4 small equal denticles, but the radula I examined showed the central tooth to have always 2 cusps, the right cusp bearing a single large cutting-point, but the left reflection had either 1 smaller denticle or 2 to 3 very small denticles; thus the number of denticles varies from 2 to 4. Lateral teeth with 7 denticles, the innermost largest, followed by a minute tooth, the third larger again, and the outer four very small.

Reproductive Organs.—The hermaphrodite gland is, as usually in the genus, in front of the liver, and consisting of 2 lobes. The albumen-gland is small. There is no spermoviduct. Oviduct long, cylindrical, with a glomerate gland at its upper part. Below the albumen-gland is a small prostate, from which the free vas deferens descends. Receptaculum seminis small, oval, with a short neck, distally inserted on the long vagina. Sheath of male organ long, inflated, narrowed behind where the vas deferens enters and the retractor muscle is affixed; male organ cylindrical, convolute, with regularly arranged papillæ.

Type in the Kgl. Museum für Naturkunde, Berlin.

Hab.—Auckland Islands (Dr. Krone, Captains Hutton and Bollons, and Professor Benham); Macquarie Island (Dr. Colquhoun).

6. Arthoracophorus papillatus, Hutton, 1879. Plate 31, figs. 9, 9*a*.

Janella papillata, Hutt., T.N.Z.I., xi, 1878 (1879), 332; M.N.Z.M., 27. *J. bitentaculata*, var. *papillata*, Hutt., T.N.Z.I., xvi, 206; Hedley, *l.c.*, xxv, 158. *J. papillata*, Hutt.: Hedley and Suter, P.L.S. N.S.W. (2), vii, 661; Plate, Zool. Jahrb., Anat., xi, 202, pl. 11, f. 39. *Athoracophorus papillatus*, Hutt.: Suter, J. de Conch., xli, 235: T.N.Z.I., xxvi, 124, pl. 14, f. 6–9: P. Mal. S., ii, 251: viii, 325.

Animal attaining a rather large size, the back broadly convex, tail tapering to a sharp point; colour yellowish-olive, with or without brown spots; head-shield with a median groove; notum finely granular, with 1 to 3 larger papillæ in each lateral area; mantle-area triangular, long and narrow. *Colour* yellowish-olive, sometimes brownish, very often without any colour-markings, but sometimes with rows of rather large brown spots; the dark-coloured specimens have the papillæ lighter-coloured; sole light-yellowish. *Head* with long cylindrical tentacles, the anterior half narrower than the posterior, and telescoped into the latter when retracted. The oval oral lobes are separated in

the middle by a narrow ridge and bordered by frontal grooves. The whole of the *notum* is finely granular, and there are longitudinal rows of large round papillæ, 1 to 3 papillæ in a lateral area. The *median groove* is deep and extending the whole length of the back; the head-shield, with median groove, triangular and extending about to half the distance between head and mantle-area; *lateral grooves* well impressed, some of them bifurcating toward the perinotum; they are obliquely directed backwards, and number about 15 on each side, about 11 of which are post-pallial; there is a preanal groove which sometimes is bifurcating and enclosing the anus in a triangle. The *mantle-area* is long and narrow, triangular, much longer than broad, the respiratory orifice subcentral, the *renal opening* covered by an oval flap and situated anteriorly close to the median groove. *Anus* close to the right perinotum, below the renal orifice. *Genital orifice* on the outer side of the right tentacle. *Hyponotum* usually well pronounced, about 2 mm. to 4 mm. broad, the *perinotum* forming a thread-like ridge and the side grooves, through contraction, passing over it, and partly over the *sole*, which in alcoholic specimens is aulacopod and smooth, separated from the head by a deep groove. The rudimentary *shell* consists of a number of white calcareous grains. The *eggs* are roundly oval, 4½ mm. by 5½ mm., yellowish, semitransparent. The newly hatched animal has a length of 9 mm., and shows all the grooves, head-shield, mantle-area, &c., well developed.

Measurements of a large spirit specimen: Length over back from head to tip of tail, 60 mm. Width of back, 23 mm. Sole—Length, 55 mm.; breadth, 10 mm. Breadth of hyponotum, 4 mm. Distance of anus from right tentacle, 10 mm. Distance of anus from pulmonary orifice, 8 mm. Distance of pulmonary orifice from head, 15 mm.

Dentition.—Hutton,[g] T.N.Z.I., xiv, 159, pl. 5, f. 10, 11; Suter, *l.c.*, xxvi, pl. 15, f. 10, 11.

Jaw elasmognathic.

Radula with numerous teeth, the central tooth with the cusp variously shaped, but always with 7 denticles; lateral teeth with 6 denticles, the innermost somewhat larger than the others.

Reproductive Organs (fig. 9*a*).—Hermaphrodite gland formed by the agglomeration of several lobes, with a rather short convolute duct; the albumen-gland large, elongate, smooth and compact; spermoviduct short. There are 2 accessory glands—the upper bulbose gland, which is granulose on its surface, oval, a little smaller than the hermaphrodite gland; and the lower glomerate gland, which is large, yellow, and composed of a number of undulating lobes. The receptaculum seminis has a short neck, and is proximally inserted on the vagina, but some distance from the common orifice. The sheath of the intromittant organ is slightly inflated, convolute, and rather long, the retractor muscle attached at the point where the vas deferens enters; the verge has papillæ. (Suter, P. Mal. S., ii, 28, f. 10, 11 in text).

Type in the Otago Museum, Dunedin.

Hab.—North Island: Heretaunga; Forty-mile Bush (H. S.). South Island: Pelorus Valley; Nelson; Greymouth; Little River; Riccarton Bush; Governor's Bay; Hooker Valley (H. S.); Ashburton (W. W. Smith); Invercargill. Chatham Islands (H. Travers).

Remarks.—I have not seen specimens from the Chatham Islands.

7. Athoracophorus Schauinslandi, Plate, 1897. Plate 31, fig. 10.

Janella Schauinslandi, Plate, Sitz. Ber. Naturf. Freunde, Berlin, 1897, 141; Zool. Jahrb., Anat., xi, 1898, 193–97, 268, 269, pl. 12, f. 1–3: Anatomy, 207–11, 216–21, 225–31, 235–61, 263; pl. 12, f. 14–17; pl. 13, f. 19–23; pl. 14, f. 24–28; pl. 15, f. 34–37; pl. 16, f. 41–46, 52–54; pl. 17, f. 56–60.
A. Schauinslandi, Plate: Suter, P. Mal. S., viii, 325: ix, 6.

Animal in general habitus very much like *A. papillatus*, but the lateral grooves are less numerous. *Colour* light yellowish-brown with numerous dark-brown round spots on the back; anterior part of median groove blackish; sole yellowish-white. Surface of *notum* with fine granules, and in the lateral fields there are 2 to 4 large papillæ, arranged into longitudinal rows. *Median groove* deep, beginning at the anterior part of the head-shield, with about 15 *lateral grooves* on each side, often bifurcating, 7 of them being post-pallial. *Mantle-area* triangular, limited on all sides by prominent grooves, its length twice that of the width, the respiratory orifice subcentral, renal opening in the median groove and inner angle of the mantle-area, the posterior end of which is at the middle of the length of the animal. *Anal opening* on the right side, about 2 mm. above the perinotum and below the renal orifice, with a preanal groove. *Genital orifice* outside the right tentacle. *Hyponotum* distinct. Rudimentary *shell* contained in 60–80 shell-vesicles, the grains of very variable size, some large and angular.

Length, 44 mm.; breadth, 11 mm. Length of head-shield, 8 mm. Mantle-area, 3 mm. by 6 mm. Anus 2 mm. from perinotum, and $3\frac{1}{2}$ mm. from the right angle of the mantle-area; 6 mm. from the median groove.

Jaw elasmognathic.

Radula with numerous teeth, the central tooth with 3 denticles, lateral teeth with 5 to 8 denticles, the innermost larger than the others.

Reproductive Organs.—The albumen-gland is large, smooth, compact; there is no spermoviduct and no prostate, but 2 accessory glands, a granular bulbose gland and a convolute glomerate gland. The receptaculum seminis is distal, globular, with a short duct. The male organ is usually convolute, the anterior half somewhat inflated and armed with papillæ, the posterior half more slender, without papillæ; at the end of the latter part the retractor muscle is fixed and the vas deferens enters.

Type in the Museum für Naturkunde, Bremen.

Hab.—Stephen Island, Cook Strait (Professor Schauinsland).

Remarks.—When writing the above diagnosis I had not seen any specimens of this species, but in September, 1909, Mr. T. H. Turner, principal keeper, Stephen Island, at my request most kindly sent me a number of living specimens of this slug, and I am now able to supply the following additional information :—

The living animal has a lanceolate, depressed convex body when at rest, and a full-grown specimen showed the following dimensions : Length, 37 mm. ; breadth, 15 mm. ; height, 6 mm. When crawling the animal was not much higher, but much more narrowed and longitudinally extended, the length being 55 mm. ; breadth, 10 mm. Colour yellowish-brown with the minute granules of the notum black ; the large papillæ, which usually only appear through contraction when preserved in alcohol, are marked by whitish spots surrounded by black ; mantle-area yellowish margined with black ; tentacles greyish. The tentacles are rather short, slightly clavate, with an annular swelling at the base, 3–4 mm. long when fully extended. Notum minutely and densely granular all over. The large papillæ are sometimes sharply raised, but after a short period their turgescence disappears, and the whole dorsum is left only minutely granular. The grooves are distinct and the median furrow of the head-shield is always distinct. The specimens at the disposal of Plate had no median groove on the head-shield, no doubt as a result of the mode of preservation. All the living specimens I examined had a very distinct median groove on the head-shield. The eggs are laid in clusters of 20 to 30 ; they are yellowish-white, semitransparent, globular or slightly oval, the surface distinctly puckery ; diameter, 3 mm.

8. Athoracophorus Simrothi, Suter, 1896. Plate 31, fig. 11.

Athoracophorus Simrothi, Suter, P. Mal. S., ii, 1896, 34, pl. 4, f. 3, 4 ; *t.c.*, 253 ; viii, 325. *Janella Simrothi*, Suter : Plate, Zool. Jahrb., Anat., xi, 273.

Animal (in alcohol) elongate, about five times longer than broad ; head broadly rounded, tail tapering ; back rounded, presenting a botryoidal appearance owing to the numerous strongly developed papillæ. *Colour* uniformly fulvous, the papillæ of lighter colour. *Head* with 2 tentacles, retracted, and 2 oral lobes, separated by a rather broad ridge in the middle. *Notum* with a deep median groove ; *lateral grooves* about 15 on each side, much impressed, some of them bifurcating toward the margin ; 8 to 9 grooves are post-pallial. Each lateral area contains 3 to 4 large oval papillæ, separated by fairly deep interstices ; they are round and less numerous in front of the mantle-area. *Head-shield* triangular, with a median groove. *Mantle-area* triangular, long and narrow, with the *respiratory orifice* in the middle at about the anterior third ; *renal opening* in front upon the median groove ; *anus* below it, near the perinotum ; *genital orifice* close to the outer side of the right tentacle. *Hyponotum* fairly distinct, grooved. *Sole* smooth.

Measurements : Length, 30 mm. ; breadth, 8 mm. ; height, 5 mm. Papillæ on the central part of the notum, 1 mm. by $1\frac{1}{2}$ mm., and $\frac{3}{4}$–1 mm. high.

Anatomy unknown.

Type in my collection.

Hab.—Collingwood, South Island (J. Dall).

Remarks.—I have been unable to get more specimens of this very interesting form, and my type specimen still remains a unicum. I cannot agree with Plate that this species is merely a young specimen of *A. papillatus* or *A. Schauinslandi*. The large oval crowded papillæ distinguish it at once from all the other hitherto-known species.

Subgen. 4. AMPHICONOPHORA, Suter, 1897 (em.).

Amphikonophora, Sut., P. Mal. S., ii, 1897, 256. Type: *A. giganteus*, Suter.

New Zealand slugs with dorsal median and lateral grooves; mantle-area distinct, triangular, with the renal orifice inside its anterior angle, the pulmonary opening subcentral. Anus near the mantle-area, sometimes inside it.

KEY TO SPECIES.

a. Head-shield extending to mantle-area; anus close to the latter. Central tooth of radula with 3 cusps and 5–7 denticles .. *giganteus.*

b. Head-shield extending to middle between head and mantle-area; anus inside the latter. No central tooth on radula .. *verrucosus.*

9. Athoracophorus giganteus, Suter, 1909. Plate 31, figs. 12, *a–c*.

Athoracophorus giganteus, Suter, P. Mal. S., viii, 1909, No. 5, 325, f. 4–7 in text. *A. marmoratus*, Simroth: Suter, P. Mal. S., ii, 1897, 256, f. 18 in text; not of Simroth.

Animal (spirit specimen) large, limaciform, broad in front and very gradually tapering toward the broadly rounded tail; back flatly convex, with deep grooves, and numerous small papillæ; head-shield with median groove; anus on right side of mantle-area. *Colour* uniformly yellowish-white, the larger papillæ whitish. *Head* broad, oval, the 2 tentacles retracted, mouth with 2 upper labial lobes which nearly meet in the middle, surmounted by a median triangular lobe. *Notum* with a deep median groove and inequidistant oblique lateral grooves, about 15 on each side, 8 of which are post-pallial, most of them bifurcating toward the margin; the whole surface covered with small granules, amongst which are numerous slightly larger papillæ in most of the side fields behind the mantle-area. *Head-shield* triangular, with a median groove, the posterior part reaching to the *mantle-area*, which is triangular, its length nearly twice its breadth, enclosed by grooves on all sides, the respiratory orifice subcentral; the *renal aperture* in the anterior angle. *Anal opening* close to the mantle-area, just in front of the outer angle, with a curved preanal groove. The *generative orifice* on the outer side of the right tentacle; the figure shows the exserted male organ thickly beset with small sharp papillæ. The *hyponotum* is indistinct, the *perinotum* consisting of tubercular oval swellings of the margin of the notum. *Sole* aulacopod through contraction in alcohol, the side fields with numerous transverse grooves.

central part smooth ; in front the sole is separated from the head by a deep groove. *Shell* rudimentary, consisting of very numerous and small calcareous grains, no larger ones amongst them.

Measurements of type specimen : Length over back from head to tip of tail, 92 mm. Width of back to perinotum, 32 mm. Sole—Length, 71 mm. ; breadth, 19 mm. Breadth of hyponotum, 4 mm. Distance of anus from right tentacle, 16 mm. Distance of anus from pulmonary orifice, 5 mm. Distance of pulmonary orifice from head, 22 mm. This slug, when alive and crawling, had a length of 130 mm.

Jaw (fig. 12*a*) elasmognathic, with a sharp median projection.

Radula (fig. 12*b*) large, with numerous teeth. Central tooth with 3 cusps, the median small, with 1 cutting-point ; the lateral ones triangular with 2 or 3 denticles on each. Lateral teeth with 4 denticles, the inner one largest.

Generative Organs (fig. 12*c*).—The hermaphrodite gland is not large, globular ; the albumen-gland is yellowish, tongue-shaped, compact ; the prostate is composed of globular and oval dark-grey convolutions ; oviduct long, yellow, the vas deferens adhering to it ; there are no accessory glands. The proximal receptaculum seminis is large, oval, with a short neck. Vagina very short. Sheath of male organ long, thick, tapering very gradually to the posterior end, where the vas deferens enters and the retractor muscle is affixed ; the intromittant organ with numerous small pointed papillæ.

Type in my collection.

Hab.—South Island : Collingwood, in a birch-tree ; Chausille Ridge, South Westland, at an elevation of 5,500 ft., one specimen (Rev. H. E. Newton).

Remarks.—The stomach of the specimen I dissected contained a large amount of greyish-black wood-fibres. This is the largest species of *Athoracophorus* known.

10. Athoracophorus verrucosus (v. Mts.), Simroth, 1889. Plate 31, fig. 13.

Athoracophorus verrucosus (v. Mts.), Simroth, Nova. Acta Leop.-Carol. Deutsch. Akad. Naturf., liv, 1889, 77, pl. 4, f. 11–14 : Cockerell, P.Z.S., 1891, 217 : Suter, J. de Conch., xli, 235 : P. Mal. S., ii, 251 ; viii, 328. *Janella verrucosa*, v. Mts. : Hedley, T.N.Z.I., xxv, 158 ; Hedley and Suter, P.L.S. N.S.W. (2), vii, 661 ; Plate, Zool. Jahrb., Anat., xi, 201, pl. 9, f. 10, 11.

Var. nigricans (v. Mts.), Simroth, *t.c.*, 77.

Animal rather small, elongate, with rounded head and sharply pointed tail, black, covered with small papillæ, head-shield with median groove, mantle-area triangular, anus inside its outer angle. *Colour :* The whole of the notum is uniformly black, the hyponotum is yellowish and densely besprinkled with black dots, sole and mouth yellowish-white. In the spirit specimens before me the 2 tentacles are retracted. *Mouth* with 2 roundly oval upper lobes, separated by a

narrow ridge, the continuance of the front of the head. The whole of the *notum* and anterior part of head are covered by numerous small and sharply raised papillæ, the interspaces minutely granular. *Median groove* distinct, slightly deviated to the left at the mantle-area; the oblique *lateral grooves* are rather close together, especially near the mantle; their number is about 20 on each side, half of which are post-pallial. *Head-shield* triangular, reaching to the middle between head and mantle-area; there is a shallow median groove. *Mantle-area* transversely triangular, perfectly closed by grooves, papillate, the respiratory orifice in the middle near the median groove, the anus in the outer angle. Plate states that the *anus* is close to and in front of the outer mantle-groove, but in all the specimens I have examined it is inside the mantle-groove. *Renal opening* in the inner anterior angle of the mantle-area, with a small oval flap. *Genital orifice* outside the right tentacle in the frontal groove. *Hyponotum* prominent, moderately broad, the *perinotum* marked by a thread-like cord. *Sole* not very broad, separated from the head by a deep groove. Through contraction in alcohol, the hyponotum and sole are transversely grooved, and the latter aulacopod. *Shell* rudimentary, consisting, as usual in the genus, of a number of irregularly shaped calcareous grains of various size.

Measurements: Length over back from head to tip of tail, 29 mm. Width of back to perinotum, 11·5 mm. Sole—Length, 24 mm.; breadth, 4·5 mm. Breadth of hyponotum, 2 mm. Distance of anus from right tentacle, 9 mm. Distance of anus from pulmonary orifice, 2·5 mm. Distance of pulmonary orifice from head, 12·5 mm.

Jaw small, elasmognathic, the median projection broadly triangular, rounded.

Radula with numerous teeth. Simroth states that the radula is similar to that of *A. Martensi*, but the lateral teeth have 5 to 7 denticles instead of only 4 to 6. The radula I examined had no central tooth; the lateral teeth meeting in the median line were alternately one in front of the opposite tooth, thus forming a zigzag line. The inner lateral teeth with 9 denticles, the first large, the second minute, the third about half the length of first, and the outer ones minute.

Reproductive Organs.—The hermaphrodite gland imbedded close to the salivary glands, so that the hermaphrodite duct is directed backwards. Spermoviduct present; oviduct cylindrical, not much enlarged above, but widening below, and carrying inside a hard longitudinal fold; prostate well developed; no accessory glands. Receptaculum seminis oval, proximal, with a short neck. The vas deferens is long, and enters the male organ at its distal end, where the retractor muscle is also affixed. Sheath of male organ long, spindle-shaped; the everted verge is 3 mm. long, cylindrical, with 6 longitudinal ridges of crowded high and fine papillæ, the edge of the ridges having the appearance of a saw; the grooves between the ridges transversely striated.

Type in the Kgl. Museum für Naturkunde, Berlin.
Hab.—Auckland Islands (Dr. Krone, Professor Benham).

Var. fasciatus (v. Mts.), Simroth, em. (*fuscatus*), *t.c.*, 79.

This variety is distinguished by its lighter colour, being yellowish-brown, with a black median band following the median groove, and 2 narrow black bands on each side of it, indicated by streaks and spots.

All the other characters and the anatomy are the same as in the var. *nigricans*. The type is also in the same collection, and the habitat is also the same.

It seems to be more common than the black form.

Tribe 4. DIGONOPORA.

Male and female genital orifices distant.

Fam. ONCHIDIIDÆ, Philippi.

Animal oval, rarely rounded, naked, without a shell. The dorsal surface smooth or uneven and more or less densely covered with papillæ, sometimes with frutescent appendages and oculiferous tubercles. In front, below the mantle-edge and above the mouth, is a strong roof-like frontal shield; at the base of this and above on either side is a strong cylindrical ommatophore, which is exsertile, and bears an eye on its outer side; at the sides the frontal shield is prolonged into a tentacle. The foot is large and generally broad, with fine longitudinal and transverse furrows; it is divided into three parts—the median part or sole, and the side parts or hyponota, which are a continuation of the dorsal surface, separated from it by the perinotum; the sole is truncated in front, narrowed and rounded behind. Along the right side of the foot, between sole and hyponotum, is the female genital furrow, which is ciliated during life; it begins at the female orifice, near the posterior extremity, and is continued to the transverse groove separating head and sole; in it the sperm may be deposited, and, after being closed against sea-water by lateral folds, conveyed to the female orifice. The anal orifice is behind the end of the sole in the median line. The respiratory orifice or pneumostome is behind the anus in the median line or a little to the right. Above the anterior margin of the foot, and in the median line, is the opening of the pedal gland. The orifice of the male organ is always on the head. The heart has the ventricle anterior, as in the *Opisthobranchia*. Jaw very thin and transparent. Radula broad, central tooth tricuspid, lateral and marginal teeth elongated, usually numerous, with an outer denticle.

Distribution.—Tropical to temperate seas; widely distributed in the Indo-Pacific.

Genus 1. Onchidella, Gray, 1850.

Oncidiella, Crosse and Fischer.

Body oval, mantle thick, its upper surface warty, carinated at the periphery, which is irregularly notched, often with short radial riblets; it contains large multicellular glands opening at the tips of the larger lobes. There are no dorsal branchiæ nor dorsal eyes. Hyponota in width equal to the sole or reduced to one-third of it; they have on each side a slender fold, parallel to the margin of the sole, the hyponotal line, which extends from the ommatophores to the pneumostome; this fold is wanting in other genera of the family. The female genital furrow is extended posteriorly beyond the female genital orifice, and its folds are united with the circular wall of the anus. Male genital orifice outside and a little behind the right ommatophore. Receptaculum seminis with a long neck; vas deferens short. Male organ tender, without an accessory gland, mostly with calcareous concretions in its lumen. Lung-cavity and kidney symmetrical. Chylific stomach very small. Jaw thin, striated. Radula with the central tooth tricuspid, the lateral teeth with an elongated broadly rounded inner cusp and a sharp small outer denticle.

Distribution.—All seas.

The animals live in the littoral zone, hiding in crevices of rocks during high water. They feed on algæ, and they are amphibious. They are able to remain under water for one month without any inconvenience, and, on the other hand, they can remain for the same length of time exposed to the air if there is sufficient moisture in it. The pneumostome is closed in the water, but opened in the air.

Key to Species.

A. Notum black, sometimes variegated with white.
  a. Notum smooth, with small white spots; 19 marginal glands; hyponota in width one-half to three-quarters of sole .. *obscura.*
  aa. Notum granular, with some larger papillæ.
    b. Back convex; 28–32 marginal glands; hyponota in width one-half of sole .. .. *Campbelli.*
    bb. Back sharply rounded; 16–20 marginal glands; with width of hyponota equal to that of the sole. Appendicular gland very large; receptaculum seminis distal.. *nigricans.*
B. Notum yellowish-white with brown spots and distant unequal round papillæ; 19–24 marginal glands; hyponota of the same width as the sole .. .. *flavescens.*
C. Notum yellowish-green to brown, with patches of dark grey, granular, with larger papillæ; 19–20 marginal glands; hyponota the same width as the sole .. .. { *patelloides.* *irrorata.*

1. Onchidella Campbelli, Filhol, 1880. Plate 32, figs. 1, *a*.

Onchidella Campbelli, Filhol, "Comptes Rendus," xci, 1880, 1094; Miss. I.C., 1885, 521; Index, 58.

Animal elongated oval, back convex, not keeled, warty, with numerous marginal glands. *Tentacles* short, rounded at their tips.

Sculpture: Notum with a very variable number of larger whitish papillæ, and between them very small and numerous granules; the marginal glands are of the same size as the larger papillæ, round or oval, whitish, equidistant, and numbering about 28 to 32; the hyponotum is finely granular. *Colour* black, the marginal glands and usually also the larger papillæ whitish; front of the head and posterior part of the hyponotum blackish, the rest of the under-surface yellowish-white. The *anus* is hidden under the tip of the tail, and behind it, in the median line, is the *pneumostome*. The *hyponota* are about half the width of the sole, or a little more; the hyponotal lines and the female genital furrow are distinct. *Sole* truncated in front, narrowed and rounded behind, the sides minutely wavy through contraction in alcohol.

Length over back, 18 mm.; width over back, 11 mm.; height, 4 mm.; breadth of sole, 5 mm. (medium-sized alcohol specimen).

Anatomy unknown.

Type in the Mus. Hist. Nat., Paris.

Hab.—Campbell Island, type (Filhol, Captain Bollons); Auckland Islands (Captain Bollons); Stewart Island (Professor Chilton).

Remark.—The specimens from Stewart Island which I have seen are very small.

2. **Onchidella flavescens,** Wissel, 1904. Plate 32, figs. 2, *a*.

Oncidella flavescens, Wissel, Zool. Jahrb., Syst., xx, 1904, 668, pl. 25, f. 78, 79.

Animal small, roundly oval, yellowish-white with a few brown spots on the back and also encircling the margin, with roundish papillæ. *Sculpture:* Notum with rather distant round and not much raised papillæ of unequal size. *Colour* yellowish-white with more or less numerous small brown or blackish spots; margin of notum with equidistant brown spots, between which the yellowish marginal glands, 19 to 24, are situated; ventral surface yellowish-white. The *pneumostome* is in the median line, midway between sole and perinotum. *Hyponota* of about the same width as the narrow sole.

Length, 7–8 mm.

Jaw present, very delicate, colourless.

Radula having the formula 150 + 1 + 150. Central and pleural teeth with very long basal plates; the former with 3 cutting-points, the median longer than the others; pleural teeth with an inner broader and an outer smaller cusp, with slight longitudinal lines.

Digestive and *reproductive organs* very similar to those of *O. patelloides*.

Type in the Museum für Naturkunde, Bremen.

Hab.—Chatham Islands; Mangonui (Professor Schauinsland); Auckland Harbour (H. S.).

Remark.—In the single specimen I found in Auckland Harbour the papillæ are much less numerous than in Wissel's figure.

3. Onchidella irrorata, Gould, 1852.

Peronia irrorata, Gould, U.S. Expl. Exp., xii, 1852, 291 ; atlas figs. 383, *a*, *b*. *Onchidium* (*Peronia*) *irrorata*, Gould, Crit. List, 39. *Onchidella irrorata*, Gould, M.N.Z.M., 28 ; Filhol, Miss. I.C., 521.

Elongated, oval, back arched, margins expanded, mottled olive and yellow, finely covered with minute subequal granulations, with 8 or 10 elevated radiating folds or ridges at the margin on each side, which extend a little beyond the margin and give it a dentate appearance ; head scarcely protruding beyond the body, dilated at the anterior angles ; tentacles short, slender, blue, knobbed, and with an eye-spot at the tip ; head above pale sky-blue, and also the mantle surrounding the foot ; margin beneath ochreous ; foot a little more than one-third the width of the body. (Gould.)

Length, 25·5 mm. ; breadth, 13 mm. ; height, 6 mm.

This species may be compared with *P. patelloidea*, Q. & G., which is also from New Zealand ; but, if the figure is to be relied on, it is certainly different, the colour, form, number of marginal projections, &c., being all different. (Gould.)

Type in the U.S. National Museum, Washington.

Hab.—Found in tide-pools at low water, Bay of Islands, New Zealand (Drayton) ; Cook Strait (Filhol).

Remarks.—This species has to be re-examined, and I tried to get specimens from the Bay of Islands, but failed.

In the diagnosis of Gould there is hardly anything that would separate his species from *O. patelloides*, which has always 19 to 20 marginal glands. I also think that the specimens found by Filhol in Cook Strait, and plentiful in Massacre Bay, were *O. patelloides*. I have not seen Gould's figures.

4. Onchidella nigricans, Quoy and Gaimard, 1832. Plate 32, fig. 3.

Onchidium nigricans, Q. & G., Voy. Astrol., Zool., ii, 1832, 214, pl. 15, f. 24–26 ; Dieff. N.Z., 248 ; Crit. List, 39. *Onchidella nigricans*, Q. & G. : Chenu, Man. Conch., i, 474, f. 3506 ; Hutton, C.M.M., 54 ; M.N.Z.M., 28. *Oncidiella nigricans*, Q. & G. : Wissel, Zool. Jahrb., Syst., xx, 1904, 662, pl. 25, f. 70–74 (animal, anatomy).

Animal oval, back slightly elevated, broadly keeled above, black with white marginal glands ; tentacles thick and short, rounded into a button at their extremity. *Sculpture :* The whole of the notum covered with minute granules, amongst them a number of slightly larger ones ; young specimens have very often the centre of the back more or less smooth, with a few distant papillæ only ; the number of the marginal glands varies from 16 to 20. The *hyponotum* is finely wrinkled, the hyponotal line distinct. *Colour* usually uniformly black, the marginal pores white, but sometimes the whole of the back is

reticulated with white and black, or the larger papillæ are surrounded by a whitish circle; front of head and tentacles blackish; perinotum and sole greyish-white. *Anal orifice* underneath the tip of the tail, and the *pneumostome* close behind it, also in the median line, and on the hyponotal line. *Hyponota* of the same width as the sole, which is long and narrow, rounded behind, and smooth.

Length over back, 23 mm.; breadth, 16 mm.; height, 7 mm. Width of sole, 5 mm.

Jaw small, transparent.

Radula with the central tooth tricuspid, the cusps elongated and slender; the marginal teeth with 2 slender cusps, the teeth angled at the middle.

Reproductive Organs.—The vesicula seminalis is fairly large; the appendicular gland is of enormous size; the oviduct, after separation from the vas deferens, forms a narrow tube, which unites at a short distance with the very thick neck of the receptaculum seminis, which is quite exceptional in the genus, as the receptaculum seminis usually joins the oviduct near the female genital orifice. At the anterior third of the oviduct is a half-circular muscle, and opposite it enters the tubular gland of the oviduct. The male organ has posteriorly a roundish cæcum, containing calcareous concretions.

Type in the Mus. Hist. Nat., Paris.

Hab.—North and South Islands of New Zealand; Chatham Islands (E. R. Waite). The type is from Astrolabe Bay.

Remarks.—The sculpture and the colouring are very variable; the marginal glands are sometimes very indistinctly marked with white; Quoy and Gaimard's figures show their number to be 18. Specimens from the north of New Zealand are usually much larger than those from the south.

5. Onchidella obscura, Plate, 1893.

Oncidiella obscura, Plate, Zool. Jahrb., Anat., vii, 1893, 207.

Animal fairly large, oval, blackish, smooth. *Sculpture:* Notum quite smooth; hyponotal line distinct, the outer part of hyponotum smooth. *Colour* black; under a lens small white points are visible, and amongst them are larger ones, visible to the naked eye; there are large irregular yellowish-white spots and streaks which give the notum a speckled appearance; these streaks have very often a darker spot in the centre, and inside it one of the larger white points. The *marginal glands* are equidistant, distant about 2 mm., their number being 19. *Anus* covered by the tip of the sole; *pneumostome* in the median line behind it. Breadth of hyponotum one-half to three-quarters that of the sole.

Length, 14·5 mm.; breadth, 11 mm.; height, 6 mm. Width of sole, 5 mm.

Jaw not seen.

Radula having the formula 104 + 1 + 140. Median cusp of central tooth elongated. The pleural teeth diminishing but little in size toward the margin.

Reproductive Organs.—Vesicula seminalis small, tubular; receptaculum seminis large, with a thick neck; oviduct consisting of a thin posterior and a much thicker anterior part, and where the two meet the receptaculum seminis enters; male organ long, with a small posterior cæcum containing calcareous concretions, which act as stimulating papillæ when the verge is exserted.

Type in the Kgl. Museum für Naturkunde, Berlin.

Hab.—D'Urville Island, type (Finsch); Lyttelton Harbour (H. S.).

6. **Onchidella patelloides,** Quoy and Gaimard, 1832. Plate 32, fig. 4.

Onchidium patelloides, Q. & G., Voy. Astrol., Zool., ii, 1832, 212, pl. 15, f. 21–23; Dieff. N.Z., 247; Crit. List, 39. *Peronia patelloides*, Q. & G., C.M.M., 54. *Onchidella patelloides*, Q. & G., M.N.Z.M., 28. *Oncidiella patelloides*, Q. & G.: Wissel, Zool. Jahrb., Syst., xx, 1904, 667, pl. 25, f. 75–77 (animal, jaw, radula).

Animal oval, with elevated back, margin more or less notched, yellowish-brown, sometimes with blackish streaks, back with a number of larger papillæ, the remainder with fine granules. *Tentacles* rather short, conic, brownish, with the eyes at their extremities. *Sculpture:* A variable number of larger papillæ are scattered over the notum, and the rest is densely covered by smaller tubercles, extending to the margin; hyponotum finely wrinkled, the hyponotal line distinct. *Colour* varying from yellowish-green to brownish, usually with patches or streaks of dark grey or black; the marginal glands are whitish, and number 19 to 20; Quoy and Gaimard state their number to be 16, their figure having 18; front of head blackish, rest of the under-surface greyish-white. *Anus* under the tip of the tail, and close behind it, in the median line, is the *respiratory orifice*. *Hyponota* in well-preserved specimens nearly of the same width as the foot. *Sole* long, pointed behind, smooth.

Length over back, 26 mm.; breadth, 17 mm.; height, 8 mm. Sole—Length, 12 mm.; breadth, 5 mm.

Dentition.—Hutton, T.N.Z.I., xiv, 155, pl. 4, f. B, R.

Jaw dark brown, cutting-edge indented, curved laterally. *Radula* having the formula 137 + 1 + 137. Central tooth broad, rounded in front, tricuspid, the lateral cusps small. Pleural teeth with the inner side concave, the inner cusp broad, the outer narrow and lightly curved.

Reproductive organs those typical of the genus.

Type in the Mus. Hist. Nat., Paris.

Hab.—North and South Islands of New Zealand; Chatham Islands. The type is from Astrolabe Bay.

Maori.—Pipiton (*fide* Quoy and Gaimard).

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Class IV. SCAPHOPODA, Bronn.

(= *Solenoconcha*, Lacaze-Duthiers).

Marine bilaterally symmetrical *Prorhipidoglossomorpha;* the body and shell elongated along the antero-posterior axis, and nearly cylindrical. The right and left margins of the mantle are united ventrally, and thus form a complete tube surrounding the body, but with an anterior and a posterior aperture. The head is somewhat rudimentary and devoid of eyes, but bears 2 dorsal appendages furnished with numerous long filaments. The foot is cylindrical, and adapted to digging. A radula is present, but there is no ctenidium. The sexes are separate.

The shell has the form of a very elongated cone, slightly curved, the concavity of the curve being dorsal; it is capable of containing the entire animal. The larger orifice of the shell is the anterior or cephalo-pedal aperture. Near the smaller posterior aperture the shell, being older, is also thicker. The posterior aperture is emarginated by a ventral sinus, and is furnished interiorly with a dorsal and a ventral valve, which are capable of being applied to one another. The animal lives buried obliquely in the sand, only the posterior aperture projecting into the water, and therefore it is the posterior extremity that is at once inhalant and exhalant and serves for the expulsion of the excrements and the genital products.

The buccal cavity has a simple dorsal mandible and a ventral radula, which is short and arcuate, with 5 teeth in each transverse row. The central tooth is simple and subquadrangular; the laterals stout and subtrigonal, tricuspidate, with wide bases and reflected borders; the marginals have the form of subquadrangular non-denticulate transverse plates.

The structure of the circulatory system is exceedingly simple; there are no differentiated vessels, not even a ventricle with well-developed muscular walls. There are 2 symmetrical kidneys, situated in front of the gonad on the ventral side of the middle of the body. The nervous system comprises the same 4 pairs of principal nerve-ganglia as are found in the *Gastropoda*. The sexes are always separate. The gonad is unpaired and median, and is extremely long, the sexual products being emitted through the right kidney. The embryonic shell is formed of 2 calcareous laminæ, which subsequently unite to form the tube.

With regard to their general relationships, the *Scaphopoda* resemble the *Gastropoda* in their univalve shell, and in the possession of a radula; while the pointed foot, the non-lobed velum in the veliger, the generative system, the bilateral symmetry of the organs generally,

and the absence of any definite head, eyes, or tentacles are points which approximate them to the *Lamellibranchia*. More recent investigations, however, have shown that the *Scaphopoda* are more nearly akin to the *Gastropoda* than to the *Lamellibranchia*.

The *Scaphopoda* are marine burrowing molluscs, and, as a rule, allow only the posterior extremity to project from the sand in which they hide themselves. They feed on the lowest organisms, *Diatomacea*, *Protozoa*, &c.

There are about 150 living and 275 fossil species of *Scaphopoda*. The living forms are distributed throughout all seas, from the littoral to a depth of 2,500 fathoms.

The fossil species extend back to the Middle Silurian, but are most abundant from the Cretaceous onwards.

Fam. DENTALIIDÆ, Gray.

Animal having the foot conical, with a laterally expanded and dorsally interrupted encircling sheath. Shell tubular, curved, with the greatest diameter at the anterior aperture, and tapering evenly to the posterior aperture.

Genus 1. Dentalium, Linné, 1758.

Dentalium, L., Syst. Nat., ed. x, 1758, 785. Type: *D. elephantinum*, L.

Shell tube-like, curved, but not spiral, attenuated posteriorly; posterior orifice of the shell truncated, smaller than that at the anterior end; dorsal face concave; ventral face convex. No operculum.

Vernacular Name.—Tusk-shell; elephant-tooth.

Maori.—Pipi-taiari.

Key to Subgenera.

A. Shell with longitudinal ribs.
  a. Ribs numbering 4 to 14, sometimes 20, strong near the apex, which is simple or with a very short notch.. Dentalium.
  aa. Ribs numerous; shell large and solid; apex typically with a long slit, but sometimes simple.. .. Fissidentalium.
B. Shell smooth or longitudinally ribbed; apex with a projecting pipe .. .. Episiphon.
C. Shell smooth; apex simple or with a short notch on the convex side .. .. Lævidentalium.

Subgen. 1. Dentalium, s. str.

Shell prismatic or decidedly ribbed, the ribs often very strong toward the apex, where there are generally from 4 to 14, but sometimes as many as 20; apex with no notch or slit, or a short one.

Key to Species.

A. Anterior end with 10 to 13 riblets .. .. *nanum*.
B. Anterior end with about 18 riblets .. .. *Huttoni*.

1. **Dentalium nanum**, Hutton, 1873. Plate 49, fig. 17.

Dentalium nanum, Hutt., C. Tert. M., 1; Plioc. M., 73. pl. 8, f. 78; Man. Conch. (1), xvii, 9, 210; Murdoch and Suter, T.N.Z.I., xxxviii, 303.

Shell rather small, slightly curved, gradually tapering, with about 13 longitudinal ribs. *Sculpture:* There are 8 to 10 narrow elevated longitudinal ribs at the posterior end, increasing to 10–13 anteriorly where they are much less conspicuous, flatly rounded, and more distant; in well-preserved specimens there is a secondary longitudinal sculpture, consisting of fine riblets present in the interstices and on the ribs; there are somewhat irregular undulating transverse growth-lines. *Posterior orifice* small, circular, with a thick wall. *Anterior orifice* much larger, circular, peristome thin and sharp.

Length, 38 mm.; diameter of aperture, 3 mm.; diameter of apex, 1·5 mm.

Type, from the Pliocene, in the Dominion Museum, Wellington.

Hab.—Poverty Bay; Manukau; off Great Barrier Island, in 110 fathoms; Stewart Island, in 18 fathoms (Captain Bollons); Snares, in 50 fathoms (Captain Bollons).

Fossil in the Pliocene.

2. **Dentalium Huttoni**, T. W. Kirk, 1880.

Dentalium Huttoni, T. W. Kirk, T.N.Z.I., xii, 1879 (1880), 306; A.M.N.H. (5), vi, 1880, 15; Man. Conch. (1), xvii, 71; Murdoch and Suter, T.N.Z.I., xxxviii, 303.

Shell white, lustrous, small, curved, rapidly tapering, longitudinally ribbed. *Sculpture* consisting of somewhat unequal longitudinal riblets, about 18 at the anterior end, but there is no secondary longitudinal sculpture; transverse growth-lines distinct. *Colour* white. *Posterior orifice* small, circular, simple. *Aperture* circular, with a thin and sharp lip.

Length, 15·75 mm.; diameter of aperture, 2·5 mm.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms; north of the Auckland Islands, in 85 fathoms (Edgar R. Waite).

Remarks.—The type is from the stomach of a trumpeter (*Latris hecateia*). There are three specimens, but two are no doubt *D. nanum.*

Subgen. 2. Fissidentalium, P. Fischer, 1885.

Fissidentalium, P. Fischer, Man. de Conch., 1885, 894. Type: *Dentalium ergasticum*, Fischer.

Shell large and solid, sculptured with many longitudinal riblets, the apex typically with a long slit, but often simple, sometimes with a slit divided into a series of fissures.

Mainly deep-water species, of all temperate and tropical seas, distinguished chiefly by the large size and solidity of the shell with

numerous longitudinal riblets. The apical slit is a frequent but by no means invariable feature, being here an extremely mutable character, as in most other groups of the genus.

KEY TO SPECIES.

A. Shell nearly straight, rapidly tapering .. .. .. *opacum.*
B. Shell moderately curved posteriorly, slowly tapering .. .. *zelandicum.*

3. Dentalium opacum, Sowerby, 1828.

Dentalium opacum, Sow., Zool. Journ., iv, 1828, 198; Man. Conch. (1), xvii, 70. *? D. conicum*, Hutton, C. Tert. M., 1873, 1; Plioc. M., 73, pl. 8, f. 77.

Shell nearly straight, attenuated at the apex, its diameter increasing much more rapidly than in the other species; with 17 or 18 rather blunt longitudinal ribs, with a smaller one between each; all the ribs nearly obsolete at the wider extremity; posterior fissure short, dorsal. (Sowerby.)

Length, 63·75 mm.; diameter, 7·5 mm.

Type in the British Museum; of *D. conicum*, from the Miocene, in the Dominion Museum, Wellington.

Hab.—Chatham Islands; one specimen in the Canterbury Museum. Christchurch.

Fossil.—*D. conicum* in the Miocene and Pliocene.

Remarks.—It seems to me highly probable that Hutton's species is a synonym of *D. opacum*, Sowerby. Of the latter, a few specimens were preserved in Mr. G. Humphrey's collection, with the following label: "White striated elephants teeth, per S. Sea ships, supposed New Zealand."

4. Dentalium zelandicum, Sowerby, 1860. Plate 49, fig. 14.

Dentalium zelandicum, Sow., Thes. Conch., iii, 1860, 101, pl. 223, f. 13; Conch. Icon., xviii, pl. 2, f. 8; Man. Conch. (1), xvii, 70, pl. 6, f. 81; Murdoch and Suter, T.N.Z.I., xxxviii, 303. *D. pacificum*, Hutton, C.M.M., 1873, 5; M.N.Z.M., 130; Man. Conch. (1), xvii, 70.

Shell large, slightly arcuate, rather slowly tapering, with numerous unequal ribs; apex mostly with a slit. *Sculpture*: There are narrow, but little raised longitudinal ribs of unequal strength, 18 to 20 at the posterior end, 30 to 45 at the anterior extremity, about 20 of which are stronger than the others; they are crossed by distinct dense oblique growth-lines. *Colour* white, banded with pale grey and tawny. *Posterior orifice* narrow, circular, sometimes with a ventral fissure, which is simple, narrow, and about 4 mm. long. *Aperture* oblique, the dorsal lip somewhat advancing, circular, peristome thin and sharp.

Length, 57 mm.; greatest diameter, 8 mm. (from Sowerby's figure). Length, 61 mm.; posterior diameter, 1 mm.; anterior diameter, 7–9 mm.

Type in the British Museum; of *D. pacificum*, in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms.

Subgen. 3. LÆVIDENTALIUM (Cossmann), Pilsbry and Sharp, 1897.

Lævidentalium, Cossmann, Ann. Soc. Roy. Malac. Belgique, xxiii, 1888, 9; Pilsbry and Sharp, Man. Conch. (1), xvii, 1897, 97. Type: *Dentalium incertum*, Desh.

Shell of moderate or large size, smooth, with growth-lines only, circular or slightly oval in section; apex simple (typically), or with a short notch on the convex side.

KEY TO SPECIES.

A. Apex without a notch; length about 9 times the diameter .. *ecostatum*.
B. Apex with a narrow fissure; length about 6½ times the diameter *diarrhox*.

5. Dentalium diarrhox, Watson, 1879. Plate 32, fig. 5.

Dentalium diarrhox, Watson, J.L.S., xiv, 1879, 511; Chall. Rep., xv, 4, pl. 1, f. 5; Man. Conch. (1), xvii, 109, pl. 3, f. 36–38.

Shell white (chalky), but porcellanous beneath the surface, rather straight, with a considerable bend near the apex; of rather rapid expansion from a very fine apex. *Sculpture:* The whole surface is faintly marked with scarcely impressed longitudinal lines of very equal interval (about 0·0055 in. apart); transversely it is very faintly scratched all over by very slight lines, which run elliptically round the shell. The *apex* has a very narrow, slightly ragged fissure, about 0·027 in. long, which lies unsymmetrically on the convex curve.

Length, 17·5 mm.; breadth, 2·25 mm.

Animal.—Mantle white, body pale yellow. Captacula many, fine, long, and equal, with small ovoid points. Foot and collar those of a true *Dentalium*. (Watson.)

Type in the British Museum.

Hab.—"Challenger" Station 169, north-east from New Zealand, in 700 fathoms.

6. Dentalium ecostatum, T. W. Kirk, 1880. Plate 49, fig. 15.

Dentalium ecostatum, T. W. Kirk., T.N.Z.I., xii, 1879 (1880), 306; A.M.N.H. (5), vi, 1880, 15; Plioc. M., 74, pl. 8, f. 79; Man. Conch. (1), xvii, 102, pl. 18, f. 13.

Shell rather small, slightly curved, smooth and polished, very gradually tapering. *Sculpture* consisting of faint and distant growth-lines only. *Colour* white. *Apex* circular, the lip solid, rounded. *Aperture* also circular, the lip thin and sharp.

Length, 15 mm.; breadth at anterior end, 1·75 mm. (type). Length, 17 mm.; posterior diameter, 2 mm.; anterior diameter, 3·5 mm. (Pliocene specimen).

Type in the Dominion Museum.

Hab.—Waikanae Beach.

Remark.—The type is no doubt a young specimen, and the Pliocene shell, of which the dimensions are here given, an older shell which has lost part of the posterior tube.

Fossil in the Miocene and Pliocene.

Subgen. 4. EPISIPHON, Pilsbry and Sharp, 1897.

Episiphon, P. & S., Man. Conch. (1), xvii, 1897, 117. Type: *Dentalium Sowerbyi*, Guilding.

Small, very slender, rather straight shells, needle-shaped or truncated, slightly tapering, thin and fragile, glossy and smooth, or at least without longitudinal sculpture; apex with a projecting pipe or a simple orifice; no slit, rarely a notch. (P. & S.)

The New Zealand species, described hereafter, demands a slight modification of the above diagnosis, including forms with distinct longitudinal sculpture.

Dr. W. H. Dall writes: "If the small end of the shell is accidentally broken off, the animal can repair it, and in species which have a simply tubular mantle and a thick shell the repairs take the shape of a small tube projecting from the blunt end of the large one, as it is impossible for the mantle to secrete a shell which is as large and thick as the original at the point of truncation. I have examined a great many Recent *Dentalia*, and have never seen a specimen in which the 'tube-in-tube' was not obviously the result of the above process, and I believe it always to be so. It will be understood that it is not asserted that, from a peculiar fragility or liability to transverse breakage in a species, this condition may not be almost habitual with the adults of that species; but it is undeniable that no one has ever recorded a specimen with the posterior end entirely unbroken and yet possessing the supplementary tubule." (Trans. Wagner Free Inst. of Sci., iii, pt. ii, 1892, 436.)

7. Dentalium arenarium, Suter, 1907. Plate 49, fig. 16.

Dentalium arenarium, Sut., P. Mal. S., vii, 1907, 214, pl. 18, f. 11.

Shell arcuate, tapering, thin and shining, with a yellowish tinge. *Sculpture:* At the apex 10 equidistant rounded longitudinal ribs, which may increase to 12 or more towards the anterior end; interspaces distinctly longitudinally grooved, the number of these grooves being 5 to 7, with minute fine somewhat irregular growth-rings. When the aperture has been damaged the new growth of the shell may show but traces of the costæ, being minutely reticulate. Posterior and anterior section of shell circular. *Apex* with a central small tube inserted in the partly closed orifice, with a slight dorsal direction.

Length, 19 mm.; diameter of aperture, 2·5 mm.; diameter of apex, 0·75 mm. Tube — Length, 1 mm.; diameter, 0·4 mm. My largest specimen has a length of 28 mm.

Type in my collection.

Hab.—Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons).

Fam. SIPHONODENTALIIDÆ, Pilsbry.

Siphonopoda, Sars. *Gadilinæ*, Stoliczka. *Siphonopodidæ*, Simroth.

Scaphopoda having the foot either expanded distally in a symmetrical disc with crenate continuous edge, with or without a median finger-like projection, or simple and vermiform, without developed lateral processes.

The shell is small and generally smooth, often contracted towards the mouth.

Distribution.—All seas, almost exclusively in deep water.

Genus 1. CADULUS, Philippi, 1844.

Cadulus, Phil., Enum. Moll. Siciliæ, ii, 1844, 209. Type *Dentalium ovulum*, Philippi.

Shell tubular, circular or oval in section; somewhat arcuate; varying from cask-shaped to acicular; more or less bulging or swollen near the middle or above, contracting toward the aperture; surface smooth or delicately striated.

Sect. 1. GADILA, Gray, 1847.

Gadila, Gray, P.Z.S., 1847, 159. Type: *Dentalium gadus*, Mont. *Gadus*, Montagu. ? Rang, 1829; not of Linné. *Ditrupa*, Gabb; not of Berkeley. *Helonyx*, Stimpson, 1865.

Shell decidedly curved, the general contour convex ventrally, concave dorsally; more or less swollen near the middle or toward the aperture, more tapering toward the apex; apical orifice not contracted by a callous ring, or with the callus far within and weak; edges not slit.

KEY TO SPECIES.

A. Shell considerably swollen near the broader end .. .. *colubridens.*
B. Shell not much swollen, contracted near the aperture when adult.
a. Shell with annular grooves or lines; length, 5·5 mm. .. *spretus.*
aa. Shell without annular grooves, with microscopic growth-lines only; length, 12 mm. .. .. *delicatulus.*

1. Cadulus colubridens, Watson, 1879. Plate 32, fig. 6.

Cadulus colubridens, Watson, J.L.S., xiv, 523; Chall. Rep., xv, 18, pl. 3, f. 1; Man. Conch. (1), xvii, 184, pl. 26, f. 71.

Shell like an adder's fang, long, sharp, bent, very slightly flattened, swollen near the broader end. The swell, which is faintly angulated and is at one-fourth of the length, is chiefly on the convex curve, but

is visible on the concave curve too. From the angulation the curve is very equable in either direction till about two-thirds along toward the apex, where it bends a little more. The shell is thin, brilliant, semiopaque, white. *Sculpture:* Very faint and fine scratches on the lines of growth. *Mouth* large, oval, very slightly flattened on the ventral side, from which the thin sharp edge is obliquely cut off upwards towards the convex curve. The *posterior opening* is much smaller, nearly round, and the edge is thin and chipped. (Watson.)

Length, 15 mm.; aperture, 1·75 mm. by 2·5 mm.; apex, 0·75 mm.

Type in the British Museum.

Hab.—"Challenger" Station 169, north-east from New Zealand, in 700 fathoms.

2. Cadulus delicatulus, n. sp. Plate 32, fig. 7.

Shell rather large for the genus, moderately curved, long and slender, the greatest diameter contained about 7 times in the length of the shell; the tube is gradually enlarging from the small apex; a faint swelling takes place only at the anterior sixth of length, and near the aperture the tube is contracted on all sides, but more perceptibly on the ventral or convex side. *Surface* smooth and shining, white, opaque, with microscopic fine growth-lines. Tube a little compressed vertically. *Aperture* oblique, transversely roundly ovate. *Anal orifice* circular, simple.

Length, 12 mm.; greatest transverse diameter, 1·75 mm. Aperture—Diameter anterior-posterior, 1·3 mm.; diameter transverse, 1·5 mm. Apex—Diameter, 0·5 mm.

Type in my collection.

Hab.—Milford Sound, in 100–120 fathoms (type); off Great Barrier Island, in 110 fathoms.

Remarks.—This species approaches in contour and size *C. clavatus*, Gould (China and Suez), and *C. fusiformis*, P. & S. (California), but is distinct from both. The type was dredged by the scientific party that visited the West Coast Sounds in December, 1908.

3. Cadulus spretus, Tate and May, 1900. Plate 32, fig. 8.

Cadulus (*Gadilia*) *spretus*, T. & M., T.R.S. S.Aust., xxiv, 1900, 102; P.L.S. N.S.W., 1901, 420, pl. 25, f. 52; Hedley, Mem. A.M., iv, 328; Rec. A.M., *i*, 89; Suter, T.N.Z.I., xl, 253.

Shell small, of medium proportion, well curved, variegated (in some specimens) with translucent and opaque-white rings and encircling bands. *Surface* smooth, with fine obliquely annular grooves or lines, without traces of vertical striæ. *Aperture* circular, transverse. *Tube* suddenly contracted quite near the oval aperture, but exhibits a slight dilatation at the end. (Tate and May.)

Length, 5·5 mm.: diameter of apex, 0·3 mm.; of aperture, 0·7 mm.

Type in the Tasmanian Museum, Hobart.

Hab.—Near Cuvier Island, in 38 fathoms ; Queen Charlotte Sound, in 16 fathoms (Captain Bollons) ; Dusky Sound, in 5 fathoms (A. Hamilton) ; north of Auckland Islands, in 85 fathoms (E. R. Waite). Tasmania and Australia, in 20–100 fathoms.

Remark.—Shell most like *C. panamensis*, S. & P., but seems to grow more rapidly, has greater breadth throughout, and is more curved.

Literature of the Scaphopoda.

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Plate, L. " Ueber den Bau und die Verwandtschaftsbeziehungen der Solenoconchen." Zool. Jahrb. Anat., 1892.

Class V. **PELECYPODA**, Goldfuss.

(= *Acephala testacea*, Cuvier. *Conchifera*, Lamarck. *Lamellibranchia*, Blainville. *Lipocephala*, Ray Lankester.)

Aquatic, bilaterally symmetrical, acephalous molluscs, protected by a pair of shelly valves, which are secreted by the lateral portions of the mantle, connected by a ligament, and moved by the contractions of muscles attached to the inner faces of the valves; feeding by ciliary action, and destitute of a radula or jaw; breathing by lateral gills; imperfectly sensible to light, and rarely provided with peripheral visual organs; possessing olfactory organs (osphradia), auditory and equilibrating organs (otocysts), tactile papillæ, and a nervous system composed of ganglia united by nerves, but without a pedovisceral commissure; provided with an extensile, tactile, or locomotor organ (foot); a circulatory system containing hæmolymph, and operated by a single or paired cardial ventricle and 2 auricles; a more or less convoluted intestinal canal, with its oral and anal extremities at opposite ends of the body; a stomach; paired nephridia, connected with the pericardium, and discharging independently of the rectum; reproducing without copulation, by eggs and spermatozoa; monœcious or diœcious; development external to the ovary; the post-larval stage protected by a prodissoconch, and sometimes exhibiting a special nepionic stage. (Dall.)

All the *Pelecypoda* are aquatic. The great majority are marine, but some few families have penetrated into fresh waters. All the members of the class feed upon microscopic organisms, chiefly *Diatomaceæ* and other low forms of plant-life. Only the *Septibranchia* and some other abyssal forms are truly carnivorous.

In general, the Pelecypods are burrowing forms, living half-buried in muddy or sandy bottoms, and in this case their plane of symmetry is vertical. But many forms are completely sedentary, and are fixed by the byssus, or in a more definite manner by the shell itself, as is the case in *Spondylus*, *Ostrea*, &c. In these genera the plane of symmetry becomes horizontal, and the animal usually lies on the right side—*e.g.*, *Spondylus*, *Anomia*; more rarely on the left side, as in *Ostrea*. Some Pelecypods live in holes which they excavate either in wood, as in the case of *Teredo*, or in stone, as *Lithophaga*, *Saxicava*, *Pholadidea*, &c., or even in the shells of other molluscs.

Some Pelecypods, such as *Lima*, are nidamentous, and construct a nest by means of the byssus. Others live in the tests of Ascidians, in sponges; the few commensalistic forms generally live on or in Echinoderms; a few are commensal with Crustaceans.

Only a few species are very active: *Tellina*, *Yoldia*, &c., execute leaping movements by forcibly contracting the foot; *Lasæa*, *Sphærium*, &c., crawl on immersed bodies or on the surface of the water; other forms, notably the *Pectinidæ* and *Limidæ*, swim by rapidly opening and closing the valves of the shell; and some elongated forms in which the mantle-edges are fused for a considerable extent swim by forcibly expelling water from the posterior aperture of the mantle (*Solen*, *Solemya*).

There are more than 5,000 living species of *Pelecypoda*, of which 1,000 are *Unionidæ*. They are distributed all over the world, and some marine forms extend to a depth of 2,700 fathoms.

Fossil forms appear in the Cambrian, and become very numerous in species from the Silurian onwards. Some large groups, such as the *Palæoconcha* of the Primary and the *Rudistæ* of the Secondary deposits, are quite extinct.

Terms employed to denote various Parts of the Bivalve Shell.

The *umbo*, or *beak*, is the apex of the hollow cone, of which each valve may be regarded as consisting. The apex is usually more or less twisted, sometimes markedly spiral. As a rule, the umbones point forward; in a few genera, however, they point backward (*Nucula*).

An *equilateral* shell is one in which the umbones are more or less central with regard to its anterior and posterior portion, while in an *inequilateral* shell the umbones are much nearer one end than the other. On the other hand, *equivalve* and *inequivalve* are terms used to express the relation of the two valves to one another as a whole.

The *dorsal margin* is adjacent to, the *ventral margin* opposite to, the umbones. The *anterior* and *posterior margins* are respectively the front and hinder edges of the shell.

The muscles which serve to close the valves leave *impressions* on the inner surface of each valve. These, when both muscles are present, are known as the *anterior* and *posterior adductor impressions*. The impression produced by the muscular edge of the mantle, which curves downwards and backwards from the anterior adductor impression, is known as the *pallial line*. In shells with only one muscle it is represented by an irregular row of small marks, or it disappears altogether (*Ostrea*). The *pallial sinus* is produced by the muscles which retract the siphons.

Right and Left Valves.—The simplest way of distinguishing the valves as right and left is to hold the shell in such a way that the siphons point towards the observer, and the mouth away from him; in this position the valve to the right is called the *right valve* and the valve to the left the *left valve*. If, however, the animal is not present, it may be remembered that the ligament is nearly always behind the beaks, and that the beaks, as a rule, point forward; thus the right

and left valves can generally be named by observation of the beaks and ligament. When the ligament is median to the valves (*Ostrea, Pecten*), and the beaks are not curved, the valves may be recognised by noting the fact that the impression of the adductor muscle (in these cases always single) is nearer to the posterior than to the anterior side. In a similar way the pallial sinus, which is always posterior, furnishes a guide. In the fixed inequivalves it is sometimes the right, sometimes the left valve which is undermost; but the fixed valve is always deep, and the free valve flat. *Ostrea* and *Anomia* are always fixed by the *left* valve.

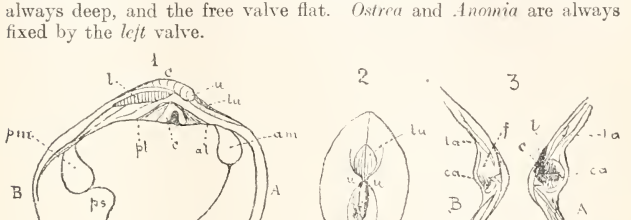

FIG. 1.—LEFT VALVE OF VENUS.

A, anterior; B, posterior; C, dorsal; D, ventral, margins. AB, length; CD, breadth, of shell. *am*, anterior; *pm*, posterior, adductor muscle; *p*, pallial line; *ps*, pallial sinus; *l*, ligament; *lu*, lunule; *u*, umbo; *c*, cardinal teeth; *al*, anterior; *pl*, posterior, lateral tooth.

FIG. 2.

es, escutcheon; *li*, ligament; *lu*, lunule; *u*, *u*, umbones.

FIG. 3.—HINGE OF RIGHT VALVE (A) AND LEFT VALVE (B) OF MULINIA.

ca, cardinals; *la*, anterior; *lp*, posterior, laterals; *f*, fossette; *c*, resilium, or cartilage; *l*, ligament.

The *lunule* is a well-marked area in front of and close to the umbones, usually more or less heart-shaped, and limited by a ridge. A corresponding area behind the umbones, enclosing the ligament, is called the *escutcheon*, but it seldom occurs.

The *ligament* proper is of a more or less horny nature, and, as the most important factor in the mechanism of the valves, has undoubtedly developed with the evolution of the class, and its chief modifications date from the earliest period in the life-history of the group. The function of the original ligament was that of an external link between the valves having the essential nature of a C spring—that is, the insertion of the ligament-edges on the cardinal margins, or, at a later period, on thickened ridges or *nymphæ*, by which these margins are reinforced to bear strains, resulted in the following conditions: The

valves being held together and, in closing, approximated by the contraction of the adductor muscles, the preservation of their precise apposition, marginally, is due to a rotatory motion, exerted along the axis of the ligament, which pulls the attached edges of the ligament nearer to each other and exerts a strain on its cylindrical exterior. This operation, with a thin ligament, involves a tensile strain on the whole cylinder; with a thick ligament, the external layers are strained and the internal layers compressed, so that to the tensile elasticity of the external layers is added the compressional elasticity of the internal portion. The result of the differing strains to which the several layers of the ligament are subjected brings about a difference of structure, and wherever the ligament becomes deep-seated there is a tendency for the respective parts to separate along the line where the two sets of strains approximate. We then have two elastic bodies operating reciprocally in opposite directions—the outer, or ligament proper, tending to pull the valves open to a certain distance, corresponding to its range of tensional elasticity; and the other, or *resilium* (cartilage or internal ligament), tending to push them open to an extent corresponding to its range of expansion. As may be seen by examining the unbroken resilium (as in *Mactra*), this organ in such cases has something of an hour-glass shape, the ends which fit into the "cartilage-pit," "fossette," or *resilifers* being more expanded then the centre between them. The deposit of lime in the form of an accessory shelly piece, usually termed the *ossiculum* or *lithodesma*, serves for the reinforcement of the resilium.

For the type of ligament which extends on both sides of the beak Neumayr adopts the designation *amphidetic*, and for the more perfected type which has been withdrawn wholly behind the beaks he employs the term *opisthodetic*. *Glycymeris* offers a conspicuous type of the amphidetic ligament; *Tellina* and *Venus* exemplify the opisthodetic arrangement.

The most perfected type of ligament is that which may be compared to a cylinder split on one side, and attached by the severed edges, one edge to each valve. This type is known as *parivincular* (*Tellina, Cardium*); its long axis corresponds with the axis of motion or vertical plane between the valves, and its position is usually opisthodetic. Another form is like a more or less flattened cord extending from one umbo to the other (*Spondylus, Lima*), with its long axis transverse to the plane of the valve-margins and the axis of motion. This is called *alivincular*. It may be central or posterior to the beaks, but, unless very short, is usually associated with an amphidetic area. A third form consists of a reduplication of the alivincular type at intervals upon the area (*Perna, Arca*), either amphidetically or upon the posterior limb of the cardinal margin. This is designated as *multivincular*, and is developed out of the alivincular type. (Dall.)

Hinge.—The valves of *Pelecypoda* are generally articulated, below the umbones, by a *hinge*, which is furnished in the majority of cases

with interlocking teeth, small pits or depressions in each valve corresponding to the teeth in the other. The teeth are distinguished as *cardinal*, or those immediately below the umbo, and *lateral*, or those to either side of the cardinals, the latter being also distinguished as *anterior* and *posterior laterals*, according as they are before or behind the umbo.

Some bivalves (*Anodonta*, *Ostrea*, many *Mytilus*) have no hinge-teeth at all; in others the laterals are wanting (*Psammobia*, *Diplodonta*). In the *Arcadæ* the hinge consists of a number of very similar denticles, which are often serrated like the teeth of a comb.

Order 1. PROTOBRANCHIA.

These are *Pelecypoda* whose distinctive character is the possession of gills with flat and non-reflected filaments disposed in two rows on opposite sides of the branchial axis. The mantle is provided with a hypobranchial gland lying on the outer side of each gill. The foot has a plantar ventral surface, and the byssogenous apparatus is but slightly developed. The nervous system generally presents a distinct pair of pleural ganglia, and the otocysts are generally open. The gut may be provided with a relic of the pharyngeal cavity, which in some cases is furnished with 2 lateral glandular sacs. The auricles of the heart are muscular; the kidneys are rather simple in structure, and glandular throughout their extent. The sexes are separate: the gonads have retained their primitive communications with the initial or internal extremities of the kidneys, but, as the two branches of each kidney have acquired a secondary communication at their anterior ends, the genital products pass direct to the external orifice of the kidney by this passage.

Fam. SOLEMYIDÆ, Gray.

Solenomyidæ.

Animal: In the gills one row of branchial filaments is directed dorsally and the other ventrally. The mantle-lobes are united ventrally, attached in front to the epidermis and valves by a broad surface, leaving no distinct pallial line; there is a single posterior siphonal and anterior pedal foramen in the mantle. The labial palps of each side are fused together. Adductor subequal. Animal dicœcious, marine, burrowing.

Shell soleniform, equivalve, low-beaked, edentulous, gaping, with the anterior end longer and the epidermis conspicuous, exceeding the valves; area obscure or none; ligament amphidetic, parivincular, becoming internally posteriorly; posterior muscle-scar with a thickened ray in front.

Silurian to Recent.

Genus 1. Solemya, Lamarck, 1818.

Solemya, Lamarck, A.s.V., v, 1818, 488. Type: *S. australis*, Lamarck.
Solenomya. *Stephanopus*, Scacchi, 1833.

Shell equivalve, elongated, cylindrical, gaping at both extremities, very inequilateral, thin, with a horny epidermis extending beyond the margins, polished, and minutely punctured; beaks posterior, low; hinge without teeth; ligament partly internal.

Distribution.—Mediterranean, east coast of North America, Antilles, Patagonia, Australasia; also tropical, abysmal.

Carboniferous to Recent.

The foot can be extended to a sharp point or to a star-shaped disc. The animals burrow in sand to a depth of 50 cm., but have also been observed leaping or swimming about in the water for some time without touching the bottom.

1. Solemya Parkinsoni, E. A. Smith, 1874. Plate 58, fig. 1.

Solemya Parkinsoni, Smith, Ereb. & Ter., 6, pl. 3, f. 1. *S. australis*, Lamarck: Reeve, Conch. Icon., xx, 1875, f. 4; not of Lamarck. *S. Parkinsoni*, Smith, M.N.Z.M., 157; Hutton, P.L.S. N.S.W., ix, 526. *Solenomya Parkinsoni*, Smith, Index, 95.

Shell moderate in size, equivalve, very inequilateral, with flat radiate ribs, dark brown, polished, epidermis extending far beyond the margin of the valves. *Beaks* very low, inconspicuous, at about the posterior third of length. *Anterior end* broadly rounded, dorsal margin straight; *posterior end* roundly angled at the middle; basal margin straight, parallel to the dorsal. *Sculpture* consisting of very low broad and flat ribs radiating from the beaks toward the margins, the interstices slightly concave. *Epidermis* polished, brown, horny, exceeding the valves, usually slit at the termination of a rib. *Colour* brown, the posterior part usually of lighter colour, with concentric and radiate darker bands; interior greyish-white, not iridescent. *Margins* inside thin and sharp. *Hinge* without teeth, a dental callosity acutely produced toward the posterior side of the valve, margining the upper part of the posterior adductor scar, and a stout callous rib running obliquely from the beak in front of the adductor-scar toward the posterior margin. *Ligament*, amphidetic, parivincular, internal posteriorly, rather narrow; anterior part extended as a narrow ridge, posterior part forming a thickened prop. Posterior *muscular scar* not very large, triangular; anterior scar large, triangular, rounded in front. An indistinct *pallial line*, concave at the middle, is mostly present.

Length, 51 mm.; height, 18 mm.; diameter, 14 mm. (large specimen).

Type in the British Museum.

Hab.—Throughout New Zealand, in fat mud about 6 in. below the surface, often washed up after gales; Kermadec Islands (Captain Bollons); Milford Sound, in 100–120 fathoms (Professor Chilton).

Fam. NUCULIDÆ, Gray.

Animal with free mantle-lobes, without siphons; pallial line simple; the labial palps free, very broad, and provided with a posterior appendage; all the branchial filaments are oriented transversely.

Shell compact, closed, with the teeth in two series meeting below the umbones, separated by a chondrophore; area represented by an obscure lunule and escutcheon; no ligament, but a wholly internal amphidetic alivincular resilium; internal layer of shell nacreous.

Ordovician to Recent.

Genus 1. NUCULA, Lamarck, 1799.

Nucula, Lamarck, Mém. Soc. Hist. Nat., Paris, 1799, 87. Type: *Arca nucleus*, L. *Nuculana*, Link, 1807. *Glycymeris*, Da Costa, 1778 (in part).

Animal with the mantle open throughout its length; labial palps very large, subtrigonal; heart situated on the dorsal side of the rectum; foot very large, the sole, when extended, forming a disc with denticulate margin; branchiæ very small, narrow, unequal; no syphons and no byssus.

Shell oval or elongate, equivalve, inequilateral, posterior side very short; umbones inclined posteriorly (opisthogyrate); surface smooth or striated; hinge angulate; ligamental pit internal, triangular, and on each side are developed numerous compressed sharp teeth; interior of the valves nacreous, adductor impressions subequal; pallial line simple.

Distribution.—In all marine zones, living in mud, sand, and gravel; over 70 species, some of them abysmal.

Fossil.—Palæozoic to Tertiary.

Vernacular Name.—Nut-shell.

KEY TO SPECIES.

A. Valves concentrically sulcate .. .. *Hartvigiana.*
B. Valves smooth, shining.
  a. Margins smooth; valves considerably longer than high .. *Strangei.*
  aa. Margins crenulated.
    b. Posterior end angular; lunule and escutcheon indistinct; length and height equal .. .. *nitidula.*
    bb. Posterior end broadly rounded; lunule and escutcheon distinct, bounded by low ridges; somewhat longer than high .. .. *castanea.*

1. Nucula castanea, A. Adams, 1856. Plate 51, fig. 1.

Nucula castanea, A. Ad., P.Z.S., 1856, 53; Conch. Icon., xviii, f. 19; M.N.Z.M., 164.

Shell small, oblique, subtriangularly oval, equivalve, inequilateral, almost smooth, shining, subcompressed, chestnut. *Beaks* small, rounded, approximate, directed backward, situate at about the posterior third. *Anterior end* sloping, lightly curved, rounded on

meeting the convex basal margin; *posterior end* short, rapidly descending, broadly rounded towards the base. *Lunule* indistinct; *escutcheon* more distinctly marked, elliptical. *Sculpture* consisting of microscopic radiate striæ and rather faint concentric growth-lines, usually with a few grooves near the margin. *Epidermis* thin, shining. *Colour* chestnut at the umbones, brownish-olive farther down. *Interior* yellowish-white, nacreous, with radiate striæ on the lower half of the valves. *Margins* finely crenate. *Hinge* with a narrow triangular resilium, directed forward. A series of sharp *teeth* on either side of the resilium, about 8 posteriorly and 17 anteriorly, those at the middle highest. The posterior *adductor scar* smaller than the anterior. *Pallial line* distinct, simple.

Length, 8 mm.; height, 7 mm.; diameter, 4 mm.

Type in the British Museum.

Hab.—New Zealand (Cuming); Taumaki Island, west coast of South Island, in 10 fathoms (Captain Bollons); Dusky Sound, in 30 fathoms (R. Henry).

Remarks.—Distinguished from the nearly allied *N. nitidula* by the much darker colour, the rounded, not angular, posterior end, and the much more distinctly limited escutcheon and lunule.

2. Nucula Hartvigiana, Pfeiffer, 1864. Plate 51, figs. 2, *a*.

Nucula Hartvigiana, Pfr., Mal. Blätter, 1864, 57. *N. sulcata*, A. Adams, P.Z.S., 1856, 53; Conch. Icon., xviii, f. 10; Crit. List, 49; Hutton, J. de Conch., 1878, 54; M.N.Z.M., 164; not of Brown. *N. consobrina*, Adams and Angas: Hutton, C.M.M., 80; not of Ad. & Ang. *N. lacunosa*, Hutton, P.L.S. N.S.W., ix, 1885, 528; Hedley, T.N.Z.I., xxxviii, 70. *N. Hartvigiana*, Pfr.: Suter, T.N.Z.I., xl, 353.

Shell small, very inequilateral, ventricose, obliquely ovate, pale olive, densely concentrically sulcate. *Beaks* at about the posterior fourth, approximate, small and not much raised, directed backwards. *Anterior end* sloping, lightly convex, sharply rounded towards the rounded basal margin; *posterior end* shortly rounded. *Lunule* indistinctly marked; *escutcheon* more distinct, bounded by a slight ridge on either side. *Sculpture* consisting of somewhat irregularly spaced narrow concentric riblets, with somewhat broader interstices which are adorned with radiate striæ visible under a lens. *Epidermis* thin, shining. *Colour* pale olive or greyish-white. *Interior* white, pearly, with distinct fine radiate striæ and crenulated margins. *Hinge* with a narrow triangular resilium, directed forwards. A series of sharp and high *teeth* on either side of the resilium, 8 posteriorly and 14 anteriorly, decreasing in size towards the apex. *Adductor-scars* of nearly equal size. *Pallial line* distinct, simple.

Length, 7·5 mm.; height, 6 mm.; diameter, 4·25 mm. (type).

Type of *N. sulcata* in the British Museum.

Hab.—New Zealand (Hartwig). Bay of Islands; off Great Barrier Island, in 110 fathoms; Hauraki Gulf, at low-water mark; Petane,

Hawke's Bay ; Wellington Harbour ; Akaroa Harbour, in 6 fathoms ; Stewart Island, in 18 fathoms ; Chatham Islands ; Kermadec Islands ; near Cuvier Island, in 38 fathoms ; Banks Peninsula ; Otago Peninsula ; Taumaki Island, in 10 fathoms ; Milford Sound, in 100–120 fathoms (Professor Chilton).

3. **Nucula nitidula**, A. Adams, 1856. Plate 51, fig. 3.

Nucula nitidula, A. Ad., P.Z.S., 1856, 51 ; Conch. Icon., xviii, f. 27 ; Sowerby, Thes. Conch., iii, pl. 229, f. 142 ; M.N.Z.M., 164 ; Hutton, P.L.S. N.S.W., ix, 528 ; Chall. Rep., xiii, 15, 225 ; Hedley, T.N.Z.I., xxxviii, 70. *N. margaritacea*, Lamarck : Hutton, C.M.M., 80 ; not of Lamarck.

Shell small, very oblique, posterior end obliquely subtruncated, anterior rounded and produced, shining, pale brown. *Beaks* small, directed backwards, approximate, situate at about the posterior third. *Anterior end* sloping, long, a little convex, narrowly rounded on meeting the regularly arched basal margin ; *posterior end* subtruncated, slightly convex, rather short, broadly rounded toward the base. *Lunule* long, lanceolate, not prominently marked. *Escutcheon* distinct, oblong, bounded by a ridge on either side. *Sculpture* consisting of minute concentric sulci and fine radiate striæ visible under a lens. *Epidermis* thin, polished. *Colour* pale brown, centre of the valves of lighter colour. *Interior* white, nacreous, radially finely striated, and the margins crenulated. *Hinge* with a narrowly triangular resilium, directed obliquely forward ; with two series of sharp *teeth*, about 7 posteriorly and 13 anteriorly, highest at the middle. *Adductor-scars* but very lightly impressed, of almost equal size. *Pallial line* distinct, simple.

Length, 5·5 mm. ; height, 5·5 mm. ; diameter, 2·8 mm.

Type in the British Museum.

Hab.—Throughout New Zealand, in muddy bottom, below low-water mark ; Bay of Islands ; off Great Barrier Island, in 110 fathoms ; near Cuvier Island, in 38 fathoms ; Hauraki Gulf, in 25 fathoms ; Gisborne ; Queen Charlotte Sound, in 10 fathoms (" Challenger ") ; Lyttelton Harbour, in 2–4 fathoms ; off Otago Heads ; Chatham Islands.

Fossil in the Pliocene.

4. **Nucula Strangei**, A. Adams, 1856. Plate 63, fig. 1.

Nucula Strangei, A. Ad., P.Z.S., 1856, 52 ; Conch. Icon., xviii, f. 15 ; C.M.M., 80 ; Ereb & Ter., 6, pl. 2, f. 14 ; M.N.Z.M., 164 ; Hutton, P.L.S. N.S.W., ix, 528.

Shell larger than the other New Zealand species, thin, obliquely ovate, inequilateral, subcompressed, yellowish-green, shining. *Beaks* small, pointed, approximate, directed backward, situate at the posterior third. *Anterior end* elongated, convex, narrowly rounded toward the convex basal margin ; *posterior end* much shorter, oblique, straight,

narrowly arched toward the base. *Lunule* elongated, not very distinctly marked off. *Escutcheon* very distinct, elliptical, bounded by a rounded ridge on either side. *Sculpture* consisting of obscure concentric sulcations and microscopic radiate striæ. *Epidermis* thin, polished, of a golden hue. *Colour* yellowish-green, lighter at the umbones. *Interior* pearly, microscopically radially striate; margins smooth, sharp. *Hinge* with a long and oblique narrowly triangular resilium; the two series of *teeth* not very high, sharp, 7 teeth on the posterior and 11 on the anterior side, highest in the middle of the row. *Adductor-scars* not deep, subequal. *Pallial line* simple, somewhat uneven.

Length, 10 mm.; height, 7 mm.; diameter, 5 mm.

Type in the British Museum.

Hab.—Near Tiri-Tiri Island, in 20 fathoms (Captain Bollons); Lyttelton Harbour, in 3 fathoms (H. S.); Stewart Island, in 15 fathoms (A. Hamilton); Cook Strait. Also Australia.

Fam. **LEDIDÆ**, Adams.

Animal: The same characters as the *Nuculidæ*, but the mantle has 2 posterior sutures and 2 united siphons; the heart traversed by the rectum; pallial line usually sinuated.

Shell as in the *Nuculidæ*, but elongated, with the ligament variable, the resilium sometimes external or absent, the internal shell layer subnacreous or porcellanous, the ends of the shell partly gaping.

Distribution.—All seas.

Silurian to Recent.

Key to Genera.

A. Ligament external.
  a. Ligament prominent, large, elongated, with 2 series of V-shaped teeth .. .. Malletia.
  aa. Ligament minute, often hidden, with 1 posterior lateral tooth and about 6 cardinal teeth .. .. .. Pleurodon.
B. Ligament internal (resilium).
  a. Shell beaked and carinated posteriorly; all teeth V-shaped Leda.
  aa. Shell not beaked and not carinated posteriorly; posterior teeth straight, elongate, imbricating .. .. Poroleda.

Genus 1. Leda, Schumacher, 1817.

Leda, Schumacher, Essai Nouv. Syst. Habit. Testacés, 1817, 173. Type: *Mya pernula*, Müller. *Nuculana*, Adams, Meek, and others; not of Link.

Animal having the mantle-borders produced posteriorly into 2 lobes which simulate a third siphon. The siphons are short and united; labial palps large, with posterior appendicles; branchiæ narrow; foot large, lanceolate in front, and forming a disc with crenulated margin. There is no byssus.

Shell solid, transversely oval, more or less beaked behind; umbones somewhat turned backward; surface concentrically and obliquely furrowed, with a posterior ridge or carina; hinge-teeth numerous,

similar ; fossette containing the resilium internal, placed below the beaks ; pallial line feebly sinuous ; internal layer porcellanous.

Distribution.—All seas, coralline and abyssal zones—2,800 metres (" Belgica "), 1,675 fathoms (" Challenger ").

Fossil in the Tertiary of New Zealand and Australia.

KEY TO SPECIES.

A. Shell always strongly concentrically sulcate ; interstices smooth or with fine growth-lines. Height to length, 1 : 1·7 .. .. .. *bellula.*
B. Shell from smooth to concentrically sulcate, with a microscopic punctate pattern. Height to length, 1 : 2 .. .. *fastidiosa.*

1. Leda bellula, A. Adams, 1856. Plate 63, figs. 2, *a*.

Leda bellula, A. Ad., P.Z.S., 1856, 49 ; Hanley, Thes. Conch., iii, 1860, 122, pl. 228, f. 74 ; Hedley, T.N.Z.I., xxxviii, 1905 (1906), 70 ; Suter, T.N.Z.I., xl, 353. *L. australis* (Q. & G.), Hutton, C.M.M., 81 ; not of Quoy and Gaimard. *L. concinna*, A. Adams, Crit. List, 49 ; Hutton, J. de Conch., 1878, 54 ; M.N.Z.M., 165 ; P.L.S. N.S.W., ix, 529 ; Index, 95 ; not of A. Adams.

Shell rather small, solid, elongately oval, with a sharp posterior beak, equivalve, inequilateral, concentrically sharply costate, colour light brown. *Beaks* at about the anterior third, approximate, rounded, slightly directed backward. *Anterior end* shorter than the posterior, dorsal margin slowly descending, thence regularly convex toward the arched basal margin ; *posterior end* longer, with a sharp beak, the dorsal margin slightly descending, concave. *Lunule* indistinct, bordered by very faint ridges. *Escutcheon* very prominent, lanceolate, very finely longitudinally striate, limited by crenated ridges, the posterior dorsal margins of the valves forming a sharp median keel. *Sculpture* consisting of subequidistant concentric sharp riblets, close together at the umbones, but further down the interspaces are broader than the riblets and contain a few growth-lines. *Epidermis* thin, not shining. *Colour* light brown. *Interior* bluish-white, porcellanous ; *margins* smooth. *Hinge-line* angulate ; *resilium* very small, triangular ; *teeth* numerous, V-shaped, the anterior series very little shorter, with about 15 teeth ; the posterior with 15 to 16 teeth. *Adductor-scars* deeply impressed, the posterior scar larger than the anterior, which is transversely striated. *Pallial line* very little sinuated.

Length, 10 mm. ; height, 5·2 mm. ; diameter, 4 mm.

Type in the British Museum.

Hab.—Off Great Barrier Island, in 110 fathoms ; five miles south of Cuvier Island, in 38 fathoms (Captain Bollons) ; near Channel Island, Hauraki Gulf, in 25 fathoms ; Cook Strait ; Dusky Sound, in 30 fathoms ; Stewart Island, in 18 fathoms.

Remarks.—Hutton followed von Martens in identifying this species with *L. concinna*. I sent a specimen from Stewart Island to the British Museum for comparison with the type of *L. bellula*. Mr. E. A.

Smith, I.S.O., kindly sent me the following report: "These valves are very like but *not quite the same*. They are more inequilateral—that is, the posterior half is *rather* longer in proportion to the anterior—the transverse sculpture is finer, and the posterior escutcheon *decidedly broader*." These rather slight differences may be due to influences of the quality of the bottom, depth, &c.

Fossil in the Pliocene.

2. **Leda fastidiosa**, A. Adams, 1856. Plate 54, figs. 18, *a*.

Leda fastidiosa, A. Ad., P.Z.S., 1856, 49; Hanley, Thes. Conch., iii, 125, pl. 228, f. 82, 83; Crit. List, 49; Hutton, J. de Conch., 1878, 54; M.N.Z.M., 165; Hedley, T.N.Z.I., xxxviii, 1905 (1906), 70, pl. 1, f. 1, 2; Clarke, T.N.Z.I., xxxvii, 416, pl. 32, f. 3. *? L. semiteres*, Hutton, T.N.Z.I., ix, 1876 (1877), 598.

Shell transversely ovate, rather thin, shining, yellowish, from nearly smooth to strongly concentrically sulcate, with a sharp posterior rostrum. *Beaks* situate near the anterior third, approximate, directed backwards, pointed. *Anterior side* rounded, somewhat produced; *posterior end* angulated, with a sharp beak, the dorsal margin concave; basal margin broadly rounded. *Lunule* indistinct. *Escutcheon* prominent, lanceolate, bordered by ridges which are smooth and rounded anteriorly, the dorsal margins of the valves forming a sharp median keel. *Sculpture* varying from the least trace of concentric riblets to a considerable development, but they are always present at the posterior angle of the escutcheon; a microscopic punctate pattern is a constant feature, present also on the finely striate escutcheon. *Epidermis* thin, shining, sometimes a little iridescent. *Colour* yellowish, lighter at the umbones. *Interior* white, lightly iridescent; *margins* smooth. *Hinge* angulate; *resilium* small, triangular; *teeth* V-shaped, the slightly shorter anterior series with about 12 teeth, the posterior with about 14; near the beaks the teeth are minute. *Adductor-scars* not deep, the posterior scar slightly larger than the anterior. *Pallial line* simple.

Length, 8·5 mm.; height, 5 mm.; diameter, 4 mm.

Type in the British Museum.

Hab.—New Zealand (Cuming). Off Great Barrier Island, in 110 fathoms.

Fossil in the Miocene and Pliocene. The specimens should be re-examined.

Genus 2. Malletia, Desmoulins, 1832.

Malletia, Desm., Actes Soc. Linn. Bordeaux, v, Feb. 1832, 85. Type: *M. chilensis*, Desm. *Solenella*, Sowerby, Dec. 1832. *Ctenoconcha*, Gray, 1840. *Neilo*, A. Adams, 1854.

Animal having the margins of the mantle fringed and with ventral lobes; siphons close together, long and slender, completely retractile; labial palps with appendicles, rolled up and as long as the shell;

branchiæ narrow, posterior; foot forming an oval disc with transversely striated margins.

Shell not nacreous inside, oval, compressed, thin, smooth or concentrically striated, gaping in front and behind, subequilateral, with epidermis; beaks small, not much raised; ligament external and elongated, resting on nymphs; hinge subhorizontal, formed by an anterior and posterior series of teeth which are very fine; there is no resilium; muscular scars not much impressed, subequal and subcircular; pallial line deeply notched behind; a linear depression extends from the umbonal cavity to the anterior adductor-scar.

Distribution.—Gulf of Panama, Peru, Chile, Strait of Magellan, New Zealand, Kerguelen Island, mid South Atlantic, Atlantic, West Indies, Japan. From the laminarian zone to about 2,550 fathoms.

Remarks.—In the Cretaceous and Eocene of Patagonia, in the Miocene of Italy and New Zealand. *Malletia* is a Patagonian genus, having reached the coast of Europe and New Zealand after long migrations. (Dr. H. von Ihering.)

Subgen. I. Neilo, A. Adams, 1854.

Neilo, A. Adams, P.Z.S., 1852 (1854), 93. Type: *N. Cumingii*, A. Ad. = *australis*, Q. & G.

Animal having a double mantle-margin, the outer edge fringed, and furnished behind with ventral lobes; the siphons are long, slender, united, and retractile; the labial palps are elongated, fimbriated at their margins, and appendiculate; the gills are narrow; and the foot is large, geniculate, compressed, and folded, forming an oval disc with crenate margins.

Shell transverse, ark-shaped, posteriorly gaping and subtruncate; surface of valves covered with a thin brown epidermis, concentrically furrowed; inside not nacreous; hinge-line nearly straight; teeth with numerous small acute comb-like denticles; ligament external, conspicuous; muscular scars wide apart; pallial line with a deep sinus.

This subgenus is known from *Malletia* by its ark-like form and by the surface of the valves being sculptured.

Distribution.—New Zealand, Gulf of Panama, and off the coast of Ecuador, in 1,672 and 741 fathoms.

1. **Malletia australis**, Quoy and Gaimard, 1835. Plate 58, figs. 2, *a*.

Nucula australis, Q. & G., Voy. Astrol., iii, 1835, 471, pl. 78, f. 5–10. Dieff. N.Z., 258. *Solenella australis*, Q. & G., Crit. List, 49; Hutton, J. de Conch., 1878, 54; M.N.Z.M., 166; P.L.S. N.S.W., ix, 529. *Neilo australis*, Q. & G., Ereb. & Ter., 6, pl. 2, f. 13. *Ctenoconcha navicula*, Valenciennes, Voy. "Venus," Moll., pl. 23, f. 7. *Neilo Cumingii*, A. Adams, P.Z.S., 1852 (1854), 93. *Solenella Cumingii*, A. Ad., C.M.M., 81.

Shell elongated oblong, equivalve, inequilateral, fairly solid, rounded in front, produced and waved behind, with concentric sharp

ribs, colour greyish-olive. *Beaks* situate a little behind the anterior third, approximate, slightly directed forward, small and low. *Anterior end* rounded, the dorsal margin somewhat sloping, straight; *posterior end* truncated, emarginated, with a short and rounded rostrum above, the dorsal margin lightly concave; basal margin nearly straight, but faintly sinuate at the posterior end. There is neither a distinct *lunule* nor an *escutcheon*. *Sculpture* consisting of a distinct carina extending from the posterior part of the umbones to the angle formed by the basal and posterior margins, dividing the surface in an anterior and posterior area; the whole surface adorned with rather distant narrow and sharp concentric riblets with broader interstices; on the posterior area the riblets are sinuous, and there is a shallow depression extending from the posterior sinus to the beak. *Epidermis* thin, not shining. *Colour* olive-green, greyish, or brownish-green. *Interior* bluish-white, porcellanous; *margins* sharp, simple. *Hinge-line* very little angulate, with numerous V-shaped small teeth increasing in size from the beaks distally; the anterior series shorter than the posterior. *Ligament* parivincular and opisthodetic, wholly external. *Adductor-scars* not much impressed, oval, subequal. *Pallial line* distinct, with a fairly deep broadly rounded sinus.

Length, 36 mm.; height, 18 mm.; diameter, 13·5 mm. (type).

Type in the Mus. Hist. Nat., Paris.

Hab.—New Zealand, very rare (Q. & G.); off Great Barrier Island, in 110 fathoms; Rangitoto Channel (T. F. Cheeseman); Wellington Harbour (A. Haylock); Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons).

Fossil in the Miocene and Pliocene.

Genus 3. Pleurodon, S. Wood, 1840.

Pleurodon, S. Wood, Charlesworth's Mag., iv, 1840, 230. Type: *P. ovalis*, Wood; not *Pleurodonte*, Fischer, 1808. *Nuculina*, d'Orbigny, 1843. *Nucinella*, Wood, 1850. *Huxleyia*, A. Adams, 1860; not of Bowerbank. *Cyrilla*, A. Adams, 1860.

Shell externally resembling *Nucula*, but having a structure much less nacreous. It is very small, oval or subtrigonal, oblique, not nacreous, equivalve, smooth, inequilateral; the anterior side short and truncated, the posterior end elongated; ventral margin smooth; hinge-line short anteriorly, cardinal border produced and angulated externally. Cardinal plate broad, with a prominent posterior lateral tooth in the left valve, the tooth being received in a depression of the plate of the opposite valve, the edge often turned up like a tooth; between the lateral tooth and the fosette there are 3 anterior cardinal teeth, very variable in form and arrangement. Ligament in an excavation under the angle of the cardinal border, nearly or quite covered by the margins of the valves. The anterior muscle-scars smaller than the posterior scars; pallial line simple. There are no dorsal areas.

Distribution.—Catalina Islands, Korean Straits, Cape of Good Hope, New Zealand, Australia.

Fossil in the Tertiary.

1. Pleurodon maorianus, Hedley, 1904. Plate 51, figs. 4, 4*a*.

Pleurodon maorianus, Hedley, Rec. A.M., v, 1904, 87, f. 14 in text; T.N.Z.I., xxxviii, 72.

Shell rather large for the genus, inflated, oval, inequilateral, smooth. *Beaks* small, rounded, submedian, slightly directed forward, approximate. *Anterior side* short, truncated; *posterior end* descending, broadly rounded; basal margin regularly and narrowly convex. *Sculpture* none, except a few incremental striæ. *Colour* white. *Interior* white, not nacreous; *margins* smooth and sharp. *Hinge-plate* broad, undulate below, posteriorly produced in a long and broad lateral tooth, having distally a subsidiary tubercle. Cardinal teeth 6, the first of the anterior series slender, the others erect and stout. *Ligament* minute. *Posterior adductor-scar* large, the anterior much smaller. *Pallial line* simple.

Length, 2·5 mm.; height, 3·25 mm.; diameter, 1 mm. (type).

Type in the Australian Museum, Sydney.

Hab.—Off Anchor Island, Dusky Sound, in 5 fathoms, type (A. Hamilton); Dusky Sound, 30 fathoms (R. Henry); off Great Barrier Island, in 110 fathoms; off Cuvier Island, in 37 fathoms; Queen Charlotte Sound, in 16 fathoms; Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons).

Genus 4. Poroleda, Tate, 1894.

Poroleda, Tate, Journ. Roy. Soc., N. S. Wales, xxvii 1893 (1894), 186. Type: *P. lanceolata*, Tate = *P. Tatei*, Hedley.

Shell like *Leda*, having an oblique internal cartilage-pit and a small pallial sinus; the hinge-line (nearly straight) with a series of longitudinal imbricating teeth on each side. (Tate.)

Distribution.—New Zealand, Australia, and Tasmania.

Fossil in the Eocene of Australia and Pliocene of New Zealand.

1. Poroleda lanceolata, Hutton, 1885. Plate 51, figs. 5, 5*a*.

Scaphula (?) *lanceolata*, Hutt., T.N.Z.I., xvii, 1884 (1885), 332; Plioc. M., 86, 1893; not of Tate, 1894: Hedley, T.N.Z.I., xxxviii, 1905 (1906), 71, pl. 2, f. 7.

Shell small, thin, compressed, smooth, much elongated, not carinated behind, equivalve, very inequilateral, the anterior portion short; valves gaping posteriorly. *Beaks* situate at the anterior fourth, minute, approximate. *Anterior end* short, narrowly rounded;

posterior end elongated, very gradually tapering, truncated at the end, the dorsal margin straight; basal margin lightly convex. Dorsal areas not differentiated. *Sculpture:* Surface smooth, with fine concentric growth-lines; 2 very inconspicuous ridges extend from the umbo to the upper and lower angle of the posterior truncation of the valves. *Epidermis* thin, polished. *Colour* yellowish-white. *Interior* white, polished, finely radially striate; *margins* smooth. *Hinge-plate* very narrow and long, curved anteriorly, straight behind, with two series of teeth; the anterior *teeth* are V-shaped, and number 5 to 7; the posterior teeth are very long and narrow, imbricating, and their number is usually 11. The two series of teeth are separated by a narrow and very oblique resilifer, directed backwards. *Adductor-scars* inconspicuous. *Pallial line* simple, with a tongue-shaped posterior sinus.

Length, 18 mm.; height, 6·25 mm. (Pliocene, type). Length, 13·8 mm.; height, 3·85 mm.; diameter, 1·8 mm. (Recent shell).

Type, from the Pliocene of Petane, in the Canterbury Museum, Christchurch.

Hab.—Dusky Sound, in 5 fathoms (A. Hamilton); off Great Barrier Island, in 110 fathoms.

Remark.—The fossil form is considerably broader in proportion to length. The proportion of height to length is 1 : 2·9 for the fossil, and 1 : 3·5 for the Recent shells.

Fossil in the Pliocene.

Order 2. FILIBRANCHIA.

These are *Pelecypoda* whose main character is the possession of gills formed of parallel, ventrally directed, and reflected filaments. The successive filaments are joined together by cilia disposed in "ciliated discs." The foot is generally provided with a highly developed byssogenous apparatus. The order comprises five suborders—*Anomiacea*, *Arcacea*, *Mytilacea*, *Pectinacea*, *Dimyacea*.

Suborder 1. ANOMIACEA.

Very asymmetrical animals, with a single large posterior adductor muscle. The heart is not contained in the pericardium, lies dorsal of the rectum, projects into the pallial cavity, and gives off a single and anterior aorta. The reflected borders of the inner gill-plates of either side are fused together in the middle line. The gonads open into the kidneys, and the right gonad extends into the mantle. Dioecious, marine.

Shell thin, monomyarian, not alate; edentulous or isodont, usually sessile; shell-substance nacreous, tubuliferous, with traces of a prismatic layer; area obscure, usually small, amphidetic; ligament obscure, with an alivincular internal resilium.

Fam. ANOMIIDÆ, Gray.

Animal with a small foot with a terminal infundibular cavity; muscles of the byssus leaving one or more impressions on the left valve.

Shell variable, irregular and inequivalve when sessile, byssiferous when young; in most genera the byssus becomes modified to a calcified or horny plug passing through a foramen in the attached valve, and fastened to other objects, a condition which may be permanent or transient; area small, amphidetic; ligament amphidetic, more or less internal, supplemented by an internal resilium, for which the crura serve as chondrophores, ali- or multi-vincular; hinge usually edentulous, rarely rugose, with amorphous interlocking rugosities; posterior adductor small, subcentral, in the sessile forms reinforced by the pedobyssal muscles, which are modified for service as adductors.

Fossil.—? Devonian; Jura to Recent.

KEY TO GENERA.

A. Processes of right valve not united; left (convex) valve with 3 central muscle-scars .. .. ANOMIA.
B. Processes of right valve united; left (convex) valve with 2 central muscle-scars, the upper one radially striate .. PLACUNANOMIA.

Genus 1. ANOMIA (Linné), Müller, 1776.

Anomia, Linné, Syst. Nat., ed. 10, 1758, 700 (in part); O. F. Müller, Prodr. Zool. Dan., 1776, xxx, 248. Type: *A. craniolaris*, L. *Echion* + *Echionoderma*, Poli, 1791. *Cepa* (Hwass), Humphrey, 1797. *Fenestella*, Bolten, 1798. *Anomya*, Agassiz, 1839. *Diploschiza*, Conrad, 1866; not *Anomia*, Da Costa, 1776, nor of Bolten, 1798.

Animal having the mantle completely open, the margins with a short double fringe; labial palps striated on both sides; 2 pairs of branchiæ on each side, without appendages, of the same size, and united posteriorly; the outer branchiæ incomplete and free; foot small, cylindrical, terminated by a cavity; near the foot a lamellate surface is secreting a calcified plug which is nothing else but a calcified byssus, attached to the left valve by 2 or 3 muscles; there is one central small adductor muscle of the valves, consisting of two elements; ovarium extending into the inferior substance of the mantle; sexes distinct; rectum not passing through the heart.

Shell irregular, subcircular or oblong, often imitating the object to which it is attached; thin, subtransparent, the interior somewhat nacreous, inequivalve; left valve entire, convex, having a ligamental fossette below the summit, and bearing 4 muscular impressions—a small one for a muscle of the byssus near the fossette, 3 others at the centre of the valve in a space (disc) circumscribed by a line; the 2 upper impressions are those of the muscles of the byssus; the infero-posterior impression is that of the adductor muscle of the valves; right valve flat, operculiform, having a large sinus on its upper border through which the plug-like byssus passes, and whose extremities are not soldered together; one of them, posterior to the sinus, is re-

curved, and bears the fossette of the ligament ; this valve has only a single adductor-muscle scar ; pallial line entire.

Distribution.—European seas, America, Antilles, India, Japan, Australasia, &c., from the laminarian to the coralline zone.

Fossil the genus appears in the Devonian ; a few species are known from the Cretaceous and Tertiary. Two or three species occur in the Tertiary of New Zealand.

Vernacular Name.—Saddle-oyster.

Remarks.—The animal of *A. ephippium*, L., has been described by S. P. Woodward in A.M.N.H. (2), xvi, 1855, 23.

According to Dr. W. H. Dall, the relative positions of the adductor and byssal scars on the left valve are not constant in the same individual at all ages, and small differences of this kind cannot safely be used as specific distinctions. The best character seems to be the more minute surface sculpture when fully developed in normal specimens.

Key to Species.

A. Surface of left valve with radiate ribs.
  a. Ribs narrow, nodulous, bifurcating. Upper byssus-scar long, tongue-shaped. Colour whitish-yellow. Shell small .. *furcata.*
  aa. Ribs irregular, interrupted. Upper byssus-scar rounded. Left valve honey-yellow, right valve green. Shell attaining a large size .. .. *Walteri.*
B. Surface of left valve without radiate ribs.
  a. Imbricating concentric lamellæ ; interior purplish in the centre *Huttoni.*
  aa. Concentric striæ and broad subparallel mostly oblique grooves ; interior white .. .. *undata.*

1. Anomia furcata, Suter, 1907. Plate 51, figs. 6, 6*a*.

Anomia furcata, Suter, T.N.Z.I., xxxix, 1906 (1907), 262, pl. 9, f. 9, 10.

Left valve circular to oval, sometimes irregular, convex, thin, semitransparent, radiately costate, and with distinct concentric ridges. *Beak* distinct, nearly smooth, and more or less median ; one specimen has a deep posterior notch, another example has 3 deep posterior notches, and 2 shallow ones on the anterior end. The dorsal margin is either straightened or flatly convex. The *sculpture* consists of narrow nodulous radial riblets, obsolete in some places, and mostly bifurcating towards the margin. The concentric ornamentation is formed by fine close and slightly undulating lines of growth, interspersed with distant stronger ridges. *Colour* whitish-yellow. *Interior* of the same colour, and somewhat pearly, with a sharp and smooth margin. There is a well-marked transversely elongate ligamental fossette. The upper byssus *muscle-scar* is long, tongue-shaped, the lower small and oval ; and the valve *adductor-scar* is of about the same size, and triangularly oval. *Pallial line* entire, simple.

Dimensions of a left valve : Length, 16 mm. ; height, 16·5 mm. ; diameter, 3 mm.

Type in the Dominion Museum, Wellington.

Hab.—Near Channel Island, Hauraki Gulf, in 25 fathoms.

2. Anomia Huttoni, n. sp. Plate 57, fig. 8.

Anomia alectus, Gray: Hutton, C.M.M., 83; J. de Conch., 1878, 55; M.Z.N.M., 173; P.L.S. N.S.W., ix, 63; (2) i, 236; Plioc. M., 90: Index, 95; not of Gray.

Shell subtrigonal, rather thin, inequilateral and inequivalve, the left valve slightly convex, the right valve flat, with 3 transverse broad and shallow grooves, the foramen moderate, elongate, the processes approaching but not united. *Anterior end* truncated, *posterior end* produced, but the outlines of the valves are, of course, variable, as is generally the case in the genus. *Sculpture:* Left valve with concentric and imbricating lamellæ; no radial sculpture. *Colour* of the left valve slightly pinkish in the centre, greyish-white towards the margins. *Interior* pearly, the left valve light purple in the centre, white towards the margins; left valve brownish-white. *Margins* sharp, lamellar. *Ligament* of the left valve under the beak, internal, triangular. The left valve with the upper *byssus-scar* large, triangular, sinuate below; the lower scar close to it below the anterior end, transversely and angularly rounded; the *adductor-scar* of the valves behind the lower byssus-scar, separated from it and the upper byssus-scar by a narrow space, outline subcircular, slightly larger than the anterior scar; all three scars within a tongue-shaped area bounded by a distinct line.

Left valve: Length, 51 mm.; height, 42 mm.; diameter, 10 mm.

Type in the Dominion Museum, Wellington.

Hab.—Stewart Island; one specimen.

Remarks.—I was unable to procure a specimen of Gray's species for comparison, but I have no doubt that the New Zealand shell is distinct from that found on the coast of Peru. The species is named after the late Captain F. W. Hutton, F.R.S.

Fossil in the Miocene and Pliocene.

3. Anomia undata, Hutton, 1885. Plate 57, fig. 9.

Anomia undata, Hutt., T.N.Z.I., xvii, 1884 (1885), 324. *Placunanomia*, sp. ind., C. Tert. M., 34. *Anomia undata*, Hutton, Plioc. M., 90, pl. 9, f. 95. *A. cytæum*, Gray: Hutton, C.M.M., 83; J. de Conch., 1878, 55; M.N.Z.M., 174; P.L.S. N.S.W., ix, 532; Index, 95; not of Gray.

Shell broadly oval to round, rather thin, especially the right valve, slightly inequilateral, inequivalve, with subparallel undulations on the left valve. *Beak* small, inconspicuous, median or anterior. All the margins of the left valve rounded. *Sculpture* of left valve consisting of concentric lamellæ and broad rather shallow and subparallel grooves, nearly vertical or oblique; right valve with V-shaped deep impressions. *Colour* whitish. *Interior* white, pearly, the impressions of the surface sculpture distinctly visible. *Margins* of left valve thin, lamellate; of right valve very thin, indented, and semitransparent. *Ligament* in the left valve in the umbonal cavity, transversely

triangular; the upper *byssus-scar* tongue-shaped, slightly sinuate below; the second below it tangential, oval; the *adductor-scar* below and behind the latter, very close to it, subcircular. *Foramen* of the right valve very large, concave in front and below, straight and thickened behind; the processes approaching, but leaving a fairly wide space between the two.

Length, 21 mm.; height, 17 mm. (type from the Pliocene). Length, 53 mm.; height, 53 mm.; diameter, 9 mm. (left valve of the Recent specimen from Stewart Island).

Type, from the Pliocene, in the Canterbury Museum, Christchurch.

Hab.—Stewart Island; one specimen.

Remarks.—The specimen in the Dominion Museum is quite distinct from *A. cytæum*, with which I have compared it.

Fossil from the Oligocene to Pliocene.

4. Anomia Walteri, Hector, 1895. Plate 57, fig. 10.

Anomia Walteri, Hector, T.N.Z.I., xxvii, 1894 (1895), 292.

Shell irregular in form, generally transversely oval, very inequivalve, inequilateral, thin, fragile, and translucent, somewhat nacreous, and with a brilliant lustre when young; adult shells are fairly solid, and only faintly shining. The anterior or the posterior end of the valves may be produced. *Sculpture* of left valve consisting of distant, irregular, mostly interrupted, radiate ribs, crossed by inequidistant concentric growth-lines; right valve mostly concave, with concentric laminæ, and sometimes with distant radiate grooves. *Colour:* Left valve rich honey-yellow, sometimes with pink tint; right valve colourless in the young, green in the adult. *Interior* of left valve iridescent, white with faint yellow and pink; right valve with a broad wide white crescent round the notch, the remainder green, the whole surface polished. *Margins* usually sharp and undulating. The *ligament* in a broadly triangular pit in the umbonal cavity. On the inner side of the left valve a triangular area of white shell extends from the cartilage-pit to the middle of the valve, containing above the rounded *byssus-scar* with a nearly straight lower margin; on the anterior two-thirds and below it, separated only by a narrow space, is the second byssal scar, which is smaller and oval; close behind it and usually posterior to the upper byssus-scar is the *adductor-scar* of the valves, very distinct also in the right valve. The *foramen* is small, nearly circular, the processes sometimes nearly meeting. Byssiferous plug calcified.

Left valve: Length, 67 mm.; height, 51 mm.; diameter, 16 mm. (medium size). Length, 91 mm.; height, 75 mm.; diameter, 20 mm. (largest size).

Type in the Dominion Museum, Wellington.

Hab.—Pahia, Bay of Islands (Th. Walter).

Fossil in the Pliocene (*teste* J. Park).

Genus 2. Placunanomia, Broderip, 1832.

Placunanomia, Broderip, P.Z.S., 1832, 28. Type: *P. Cumingi*, Broderip.
Placunomia, Swainson, 1840.

Shell having the appearance of *Anomia;* left valve with 2 tangential muscular impressions towards the centre—the upper one radially striated, is a byssal scar, and the lower one appertains to the adductor of the valves; right valve perforated, the processes soldered together; elastic ligament on 2 diverging lamellæ on the right side; the calcareous plug sometimes soldered to the margins of the orifice of the right valve.

Distribution.—European seas, Antilles, North Pacific, Australasia, &c.

Fossil in the Tertiary of Australia and New Zealand.

Vernacular Name.—Saddle-oyster.

1. Placunanomia zelandica, Gray, 1843. Plate 56, figs. 1, 1*a*.

Anomia zelandica, Gray, Dieff. N.Z., 260. *Placunanomia zelandica*, Gray, P.Z.S., 1849 (1850), 123; Hutton, C.M.M., 84; M.N.Z.M., 174; P.L.S. N.S.W., ix, 532. *Anomia* (*Placunanomia*) *zelandica*, Gray, Ereb. & Ter., 7, pl. 3, f. 10; Conch. Icon., xi, f. 4. *Placunanomia ione*, Gray, P.Z.S., 1849 (1850), 123; Hutton, M.N.Z.M., 174; P.L.S. N.S.W., ix, 533. Conch. Icon., xi, f. 6; C. Tert. M.B.M., 303. *Anomia Stowei*, Hutton, C.M.M., 83; M.N.Z.M., 173; P.L.S. N.S.W., ix. 532. *Placunanomia Stowei*, Hutton, J. de Conch., 1878, 55.

Shell variable in form, mostly orbicular; left valve fairly solid, convex; the right thin, translucent, flat; young shells are sometimes quite smooth, but generally they have wavy radiate riblets composed of semicylindrical hollow spines, which form continuous ribs in the adult; inequivalve and more or less inequilateral. *Beak* of left valve small, convex, smooth; dorsal margin sometimes straight, but more often rounded. *Sculpture* consisting of radiate ribs on the left valve, sometimes rather distant and wavy, especially in young shells, but usually close together, all intermediate grades occurring; concentric laminæ, partly interrupting the radial sculpture, are more or less prominent; right valve with concentric ridges and grooves, frequently crossed by narrow wavy and interrupted grooves. *Colour* white, often greenish at the centre. *Interior* of left valve dark green in the middle, lighter towards the margin; right valve with a broad white porcellanous area round the foramen, light olive outside. *Margins* thin, laminated. *Ligament* in the umbonal cavity, transversely triangular. *Byssal scar* at the upper third of the height in the median line of the left valve, large, oval, radially finely striated; slightly below and behind, and confluent with it, is the much smaller round or slightly oval *adductor-scar*, both included in a triangular area. Right valve with a moderately large pyriform *foramen*, closed above; on the

posterior and lower side of it is the very slightly impressed adductor-scar. Byssiferous plug calcified.

Left valve: Length, 67 mm.; height, 55 mm. (type). Length, 95 mm.; height, 95 mm.; diameter, 16 mm.

Type in the British Museum.

Hab.—New Zealand (Dr. Stanger). Hauraki Gulf; Wellington; Pelorus Sound; Picton; Queen Charlotte Sound, in 16 fathoms; French Pass, in 12 fathoms (Captain Bollons); off Lyttelton, in 100 fathoms; off Shag Point, in 30 fathoms; off Cape Saunders, in 100 fathoms; off Long Point, in 120 fathoms (E. R. Waite); Dusky Sound (A. Hamilton); Foveaux Strait; Stewart Island; Snares and Bounty Islands, in 50 fathoms (Captain Bollons). Also Australia.

Remarks.—I have never been able to distinguish more than one species amongst the considerable number of New Zealand shells which I have examined, and comparison of specimens of the Australian *P. ione* with the shells found on our shores has confirmed my view that the later species of Gray, *P. ione*, is a synonym of his *P. zelandica*. Hutton's *A. Stowei* is absolutely identical with *P. zelandica*, as is evidenced by the diagnosis and the type specimen, which is in the Dominion Museum, and which I have examined.

Fossil in the Pliocene and Miocene; also in the Miocene of Australia.

Suborder 2. ARCACEA.

Symmetrical animals, with the mantle open throughout its extent, and with generally well-developed anterior and posterior adductor muscles; the pallial line simple, without siphons; foot variable, deeply grooved, byssogenous. The heart lies in the pericardium, and gives off 2 aortæ. The gills are free and without interlamellar junctions. The renal and genital orifices are separate.

Shell of varied form, usually with a pilose epidermis, porcellanous, with tubuliferous non-prismatic external layer; area typically amphidetic; ligament external, ali- or multi-vincular.

Marine or fluviatile.

Fam. **ARCIDÆ**, Dall.

Animal having a stout, short, deeply grooved foot, very often with a byssus; 2 adductor muscles of about equal strength. The borders of the mantle bear compound pallial eyes. The labial palps are direct continuations of the lips.

Shell trapezoidal or rounded, with the posterior side longer; ligament usually multivincular; hinge typically taxodont, with the teeth in two similar series, meeting below the beaks, and approximately vertical to the margin of the valve.

Jura to Recent.

KEY TO GENERA.

A. Shell more or less subrhomboidal, hinge straight .. .. ARCA.
B. Shell orbicular or suborbicular, hinge curved .. .. GLYCYMERIS.

Genus 1. ARCA (Linné), Lamarck, 1799.

Arca, Linné, Syst. Nat., ed. 10, 1758, 693; Lamarck, Prodrome, 1799, 87. Type: *A. noæ*, Linné. *Daphne* and *Daphnecoderma*, Poli, 1795. *Byssoarca*, Swainson, 1835. *Thyas*, Gray, 1857. *Cibota* (Browne), Mörch, 1852. *Arcoptera*, Heilprin.

Animal having the foot long, bent, grooved, and with a byssus; gills long and narrow, oblique, deeper striated on the inner side; heart above the rectum.

Shell commonly equivalve, subrhomboidal, ventricose, costulate or cancellate; borders of the valves either smooth or dentate; hinge straight, horizontal, furnished with very numerous short teeth; umbones prominent, curved inwards, separated from each other by a more or less broad area, which carries several ligamental striæ, or well-marked narrow linear grooves commonly V-shaped; impressions of the adductor muscles of the valves subequal, the anterior being rounded, the posterior divided; impression of the posterior adductor of the byssus elongate and situated near the cardinal line, that of the anterior adductor of the byssus small; pallial line simple.

Distribution.—About 150 species from all seas are known, the maximum from the tropical seas; a few are abysmal.

The *fossil* species are numerous.

Vernacular Name.—Noah's Ark shell.

KEY TO SUBGENERA.

A. Shell equivalve; teeth vertical in the middle .. .. BARBATIA.
B. Shell inequivalve, left valve larger than the right; teeth more or less oblique .. .. SCAPHARCA.

Subgen. 1. BARBATIA (Gray), Adams, 1858.

Barbatia, Gray, Synops. Brit. Mus., 1840, 151; *ibid.*, 1844, 81. Type: *Arca barbata*, L. *Barbatia*, H. and A. Adams, Ad. G.R.M., ii, 185 53

Shell oblong, longitudinal, or subquadrate; surface of valves covered with an epidermis, which is usually loose and rough. The cardinal area is narrow, with numerous grooves for the resilium, which form a series of elongated concentric lozenges on the area; the shell is not conspicuously truncate or keeled; the teeth are small and vertical in the middle of the series, and towards the end diverge distally and become larger and more distant. Pallial impression entire.

KEY TO SECTIONS.

A. Ligament forming a series of elongated concentric lozenges on the area .. .. BARBATIA.
B. Ligamental area narrow, leaving a free anterior and sometimes also posterior area .. .. ACAR.

Sect. 1. Barbatia, s. str.

1. Arca decussata, Sowerby, 1833. Plate 56, figs. 2, 2*a*.

Byssoarca decussata, Sow., P.Z.S., 1833, 18. *Arca decussata*, Sow., Conch. Icon., ii, pl. 12, f. 81; Hutton, P.L.S. N.S.W., ix, 528. *Barbatia decussata*, Sow.: Hutton, J. de Conch., 1878, 53; M.N.Z.M., 162; Index, 94. *B. sinuata*, Lamarck: Hutton, C.M.M., 79; not of Lamarck.

Shell oval-elongate, equivalve, inequilateral, the anterior part shorter, radiately ribbed and decussated by fine concentric lines, white to brown, pilose. *Beaks* prominent, distant, directed forward, keeled posteriorly. *Anterior end* rather short, regularly rounded; *posterior end* produced, sloping and usually sharply rounded towards the basal margin, which is generally sinuate and the valves gaping. *Area* straight, broadly triangularly grooved, not very broad. *Sculpture* consisting of very numerous, unequal and close radiate ribs, cut up into oblong nodules by concentric fine grooves. *Epidermis* brown, horny, produced into rather long hair-like processes arising from the interstices between the riblets; the epidermis is mostly retained only near the margins of the valves. *Colour* white to light brown. *Interior* white, sometimes with a few brownish streaks and spots at the posterior end, polished outside the pallial line; inside it very finely radially striated. *Margins* sharp, crenulate. *Hinge-plate* very narrow in the middle, but broadening distally. *Teeth* numerous, small, vertical, and close together under and some distance behind the umbones; oblique, larger, and more distant towards the ends; the outer teeth are triangularly elevated, and have a denticulate edge; sometimes the anterior outer teeth are slightly V-shaped. *Ligament* external. *Adductor-scars* subequal. *Pallial line* simple.

Length, 58 mm.; height, 30 mm.; diameter, 24 mm.

Type in the British Museum.

Hab.—Throughout New Zealand, but not common. Bay of Islands; Hauraki Gulf; Queen Charlotte Sound, in 16 fathoms (Captain Bollons); Chatham Islands.

The species has a wide range of distribution. Von Martens (J.L.S., Zool., xxi, 207) mentions the following localities: Mergui Archipelago, Red Sea, Mauritius, Ceylon, Salang, Singapore, Celebes, Philippines, New Zealand, Viti, and Paumotu Islands.

Remarks.—The byssus forms a solid laterally compressed horny mass. The shell is very variable in outline, according to the individual position. The byssus is attached to stones, but the animals burrow in old corals in the Mergui Archipelago, &c.

Maori Name.—Turoro (*fide* Captain Bollons).

Fossil in the Oligocene, Miocene, and Pliocene.

Sect. 2. Acar, Gray, 1847.

+ *Daphnoderma*, Mörch, 1853 + *Fossularca*, Cossmann, 1887. Type: *Arca donaciformis*, Reeve.

Shell with the valves cancellately ribbed or costated; hinder slope subcarinate; ligamental area narrow, leaving the anterior part of

the area bare (*Acar*), or leaving a bare space before and behind it (*Fossularca*).

2. **Arca reticulata,** Gmelin, 1790. Plate 58, fig. 3.

Arca reticulata, Gmel., Syst. Nat., ed. 13, 1790, 3311; Dall, "Blake" Pelecypoda, 1886, 242; Dall and Simpson, Moll. of Porto Rico, 1901, 460. *A. squamosa*, Lamarck, A.s.V., vi, 1819, 45. *A. domingensis*, Lamarck, *ibid.*, 40; Chall. Rep., xiii, 265. *A. clathrata*, Lamarck, *ibid.*, 46 (*fide* Deshayes). *A. gradata*, Broderip and Sowerby, Zool. Journ., iv, 1829, 365. *Byssoarca divaricata*, Sowerby, P.Z.S., 1833, 18; Conch. Icon., ii, 1844, pl. 16, f. 108. *? Arca donaciformis*, Reeve, Conch. Icon., ii, 1844, pl. 16, f. 104; Crit. List, 48; Hutton, P.L.S. N.S.W., ix, 528. *Barbatia pusilla*, Sowerby, C.M.M., 79; J. de Conch., 1878, 79; M.N.Z.M., 162; not of Sowerby. *B. reticulata*, Chemnitz, Index, 94.

Shell ovato-subrhomboidal, inflated, rather small, reticulated, equivalve, inequilateral, anterior and posterior slope carinated, ligamental lozenge extending very little behind the beaks, yellowish-white or light brown. *Beaks* situate at about the anterior third, distant, pointed, and directed forwards. *Anterior end* short, rounded; *posterior end* larger, the dorsal margin angled behind, the posterior margin obliquely descending and very narrowly rounded or angled on meeting the straight basal margin. *Cardinal area* deeply excavated, narrowly elliptical. *Sculpture* consisting of close fine radial riblets with deep furrows between them, crossed by equally prominent concentric riblets, cancellating the surface; cardinal area finely longitudinally striated. *Colour* light brown, sometimes yellowish-white. *Interior* whitish, dull, with faint radiate striæ. *Margins* crenate, but the foramen for the byssus smooth. *Hinge-plate* narrow in the middle, widening at both ends, slightly curved; *teeth* small and vertical beneath and some distance behind the beaks, oblique and slightly curved at the ends of the plate. *Ligament* small, cordiform, between the umbones and very slightly extending posteriorly, leaving the area free in front and behind. *Adductor-scars* unequal, the posterior scar somewhat larger. *Pallial line* simple.

Length, 23 mm.; height, 13 mm.; diameter, 11 mm. (large specimen). Length, 12 mm.; height, 8 mm.; diameter, 7 mm. (usual size).

Hab.—Throughout New Zealand; rare, according to Hutton: Stewart Island, in 15 fathoms (A. Hamilton). Also Australia and Tasmania, Japan, Antilles, Gulf of Mexico, Brazil, Mozambique, Cape Verde Islands, &c.

It has not been found living from more than 100 fathoms. (Dall.)

Subgen. 2. Scapharca (Gray), Dall, 1898.

Scapharca, Gray, P.Z.S., 1847, 206; Dall, Trans. Wagner Free Inst., iii, pt. iv, 1898, 617. Type: *Arca inequivalvis*, Brug.

Shell inequivalve, the left valve larger than the right, oval or oblong, subquadrangular, subequilateral, ventral margins closed, surface with radial costæ, teeth more or less oblique. Animal with a byssus.

Sect. 1. Bathyarca, Kobelt, 1891.

Bathyarca, Kobelt, Conch. Cab., ed. 2, viii, Arca, 1891, 213. Type: *Arca pectunculoides*, Scachi.

Shell small, usually abyssal, inflated, with prosogyrate beaks and a rather narrow but long furrowed area, the hinge-margin nearly or quite as long as the shell; teeth few, oblique, in two series, often separated by a wide gap in the centre; the right valve smaller, the sculpture of the two valves often very discrepant; epidermis usually imbricated.

Fossil from the Eocene.

3. Arca cybæa, Hedley, 1906. Plate 51, figs. 7, 7*a*.

Bathyarca cybæa, Hedley, T.N.Z.I., xxxviii, 1905 (1906), 71, pl. 1, f. 3, 4. *Arca* (*Bathyarca*) *cybæa*, Suter, T.N.Z.I., xl, 353.

Shell small, oblong, short and inflated, inequivalve, a little inequilateral without impressed ray, posteriorly and anteriorly rounded, sinuate beneath the beak. *Beaks* much inrolled, at a third of the length of the shell. *Ligamental area* narrow. *Sculpture* finely reticulate; a series of delicate subequal evenly spaced riblets radiate from the umbo to the margin; as growth proceeds new riblets are intercalated till about 50 reach the margin; the radiate radii are broken into short lengths by concentric growth-lines which produce minute prickles at the point of intersection. *Epidermis* very light brown, thin, very easily peeling off. *Colour* light brown, white when devoid of epidermis. *Interior* rayed by imprint of external sculpture, white, lightly shining. *Margins* finely crenulate within, except at byssal gape. *Hinge-plate* edentulous under the beaks, posteriorly with 4 nearly horizontal, anteriorly with 4 highly inclined small *teeth*.

Length, 3 mm.; height, 2·15 mm.; diameter, 2 mm; (type).

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms; near Cuvier Island, in 38 fathoms (Captain Bollons); off Lyttelton, in 100 fathoms (E. R. Waite); near the Snares, in 50 fathoms (Captain Bollons).

Remarks.—This species is nearest allied to the Australian *B. perversidens*, Hedley, from which it differs by the less development of the posterior side. (Hedley.)

Genus 2. Glycymeris, Da Costa, 1778.

Glycymeris, Da Costa, Brit. Conch., 1778, 168. Type: *Arca glycymeris*, L. *Tucetа*, Bolten, 1798. *Axinæa* and *Axinæoderma*, Poli, 1791. *Pectunculus*, Lamarck, 1799. Not *Glycymeris*, Lamarck 1799.

Animal with the mantle open throughout; foot without byssus, but with a plantar surface; the heart traversed by the rectum.

Shell orbicular or suborbicular, equivalve, equilateral or nearly so, convex, solid and thick, inside porcellanous, with a velvety epidermis on the outside; beaks slightly curved inward, nearly straight;

ligament external, its area distinct and with diverging grooves; cardinal border regularly arched or semicircular; teeth prominent, strong, short, numerous, becoming obliterated under the umbones as the gerontic stage is approached, by the invasion of the ligamental area; margins of the valves crenulated; adductor-scars subequal; pallial line simple.

Distribution.—About sixty species are known from Australasia, west coast of America, Indian Ocean, Antilles, seas of Europe, &c., living in sandy gravel from about 5 to 90 fathoms.

Fossil.—Cretaceous and Tertiary.

Vernacular Name.—Dog-cockle or comb-shell.

KEY TO SPECIES.

A. Shell attaining a large size, with broad rounded radiating ribs .. *laticostata.*
B. Shell small, finely radiately striate .. .. *modesta.*

1. **Glycymeris laticostata,** Quoy and Gaimard, 1835. Plate 56, figs. 3, 3*a*.

Pectunculus laticostatus, Q. & G., Voy. Astrol., iii, 1835, 466, pl. 77, f. 4–6; Conch. Icon., i, 1843, f. 8; Dieff. N.Z., 257; C.M.M., 80; Crit. List, 49; Hutton, J. de Conch., 1878, 53; M.N.Z.M., 163; P.L.S. N.S.W., ix, 528; C. Tert. M.B.M., 341. *P. ovatus*, Q. & G., *l.c.*, 467, pl. 77, f. 1–3. *P. Maccoyi*, Johnston, P.R.S. Tas., 1884, 199. *Glycymeris laticostata*, Q. & G., Index, 94.

Shell attaining a large size, thick and solid, orbicular, convex, equilateral or subequilateral, with broad rounded radiating ribs. *Beaks* median, distant, turned inwards and very slightly forwards, pointed. *Anterior* and *posterior end* broadly convex, with straight dorsal margins; the basal margin regularly arched. The *ligamental area* long, narrowly elliptical. *Sculpture* consisting of broad rounded radiating ribs, obsolete towards the margin in old individuals, crossed by fine concentric lines and well-marked growth-periods towards the margins. *Epidermis* lost in all specimens I have seen. *Colour* reddish or yellowish-brown, often variegated with white. *Interior* white or brownish, finely radially striated, porcellanous. *Margins* crenated inside on the lower half of the valves. *Hinge-plate* arcuate, moderately broad in the middle, but widening on both ends; young shells with a few small oblique *teeth* under the beaks, and about 6 oblique or nearly horizontal teeth on each side; in adult shells the ligamental area is getting very high, the hinge-plate very narrow in the middle, and the teeth on each side are reduced in number to 2 or 3. *Ligament* in divaricating external grooves. *Adductor-scars* distinct, subequal. *Pallial line* simple.

Length, 70 mm.; height, 73 mm.; diameter, 50 mm. Length, 105 mm.; height, 110 mm.; diameter, 60 mm. (large form).

Type in the Mus. Hist. Nat., Paris.

Hab.—Throughout New Zealand. Cape Maria van Diemen; Bay of Islands; near Cuvier Island, in 38 fathoms; Hauraki Gulf, from

near low-water mark to 25 fathoms; Foveaux Strait, in 18 fathoms; Stewart Island; Chatham Islands; Kermadec Islands (Captain Bollons).

Fossil in the Eocene, Miocene, and Pliocene of New Zealand, Tasmania, Victoria, and South Australia.

2. **Glycymeris modesta**, Angas, 1879. Plate 51, figs. 8, 8*a*.

Axinæa modesta, Angas, P.Z.S., 1879, 418, pl. 35, f. 4. *Pectunculus striatularis*, Lamarck: Hutton, C.M.M., 80; J. de Conch., 1878, 53; M.N.Z.M., 163; P.L.S. N.S.W., ix, 528. *Glycymeris striatularis*, Lam., Index, 94; not of Lamarck. *G. velutina*, Suter, T.N.Z.I., xl, 1907 (1908), 354, pl. 30, f. 1, 2.

Shell small, rounded-triangular, solid, moderately convex, finely radially ribbed, with zigzag or radial brown streaks, equivalve and subequilateral. *Beaks* central, slightly curved forwards, close together, small, and low. *Anterior end* with the dorsal margin descending, nearly straight, slightly angled on meeting the basal margin; *posterior end* with the dorsal margin sloping, but more convex, rounded on meeting the basal margin, which is regularly convex. *Lunular area* slightly flattened. *Sculpture* consisting of numerous close and fine radial riblets, about 9 per millimetre on the centre of the valves, crossed by very fine dense concentric striæ. *Epidermis* brown, horny, persistent near the margins, velvety, beset with numerous fine short bristles. *Colour* whitish or yellowish-brown, with reddish-brown zigzag or radial streaks, which, however, are usually very faint in specimens from deep water. *Interior* white, porcellanous, faintly radially striate, sometimes stained with dark brown on the anterior lower end. *Basal margin* very prominently crenate. *Hinge-plate* broad and rather high, its upper margin horizontally straight, the lower margin regularly concave; *teeth* numerous, interrupted in the middle, more or less hooked, decreasing in size distally, finely pectinated. *Ligament* external, thick, amphidetic. Anterior *adductor-scar* slightly smaller than the posterior. *Pallial line* simple, well marked.

Length, 24 mm.; height, 22 mm.; diameter, 12·5 mm. (type).

Type in the British Museum.

Hab.—Throughout New Zealand, from below low-water mark to about 40 fathoms. Bay of Islands; Hauraki Gulf, in 25 fathoms; Cuvier Island, in 38 fathoms; Tauranga; Nelson; Akaroa Harbour; Otago Peninsula; Taumaki Island, in 10 fathoms; Kermadec Islands (Captain Bollons).

Remarks.—Regarding this species Mr. C. Hedley, Sydney, sent me the following information: "Dr. Lamy, Paris, considers *G. velutina*, Sut. = *G. modesta*, Angas, 1879. He compared a specimen I sent him with one he had from the British Museum, so it seems all right. The 'original' locality is Australia, which is wrong, and put us off the track."

Fossil in the Pliocene.

Fam. LIMOPSIDÆ, Dall.

Animal with the foot elongate, pointed anteriorly and posteriorly. Shell suborbicular, the hinge curved, the ligament simple, small, external or only partly so, interrupting the line of teeth, with the transverse axis longer than the longitudinal.

KEY TO GENERA.

A. Shell with a hairy epidermis, beaks median, ligament external .. LIMOPSIS.
B. Shell smooth or sculptured, beaks anterior, ligament internal .. LISSARCA.

Genus 1. LIMOPSIS, Sasso, 1827.

Limopsis, Sasso, Giorn. Ligust. Sci. Let. et Arti, Genova, i, 1827, 476. Type : *Arca aurita*, Brocchi. *Pectunculina*, d'Orbigny, 1844. *Trigonocælia*, Nyst et Galeotti, 1835. *Felicia*, Mabille et Rochebrune, 1889. *Cosmetopsis*, Rovereto, 1898.

Animal similar to that of *Glycymeris ;* foot with a longitudinal groove and a much reduced byssus, with which the animal can fix itself to submarine bodies.

Shell ovato-rotund, slightly oblique behind, thick, with a hairy epidermis ; umbones median, prominent ; area well marked but narrow ; fossette of the ligament vertical, triangular, under the beaks ; hinge-plate thick, broad, arched, with two series of teeth, their number small ; the anterior adductor-scar frequently very small.

Distribution.—Australasia, Japan, west coast of Central America ; Red Sea, European seas, &c. ; living at variable depths, also abysmal.

Fossil.—Trias to Tertiary. Two species are recorded from New Zealand, one of which, *L. Zitteli*, von Ihering (= *insolita*, Hutton, not of Sowerby) is nearly allied to *L. insolita*, Sowerby, of the Tertiary of Patagonia.

1. **Limopsis lata**, E. A. Smith, 1885. Plate 51, figs. 9, 9*a*.

Limopsis lata, Smith, Chall. Rep., xiii, 1885, 257, pl. 18, f. 7, 7*a*.

Shell moderately thick and ventricose, somewhat oblique, of a dirty-whitish colour. The *umbones* are acute when not eroded at the tips, as is frequently the case, and located a trifle in advance of the middle. The *anterior side* is broadly curved and very oblique below the middle, the *posterior* being less regularly arcuate and in some examples somewhat truncated. The *hinge margin* is straight and rather long. The *sculpture* consists of fine radiating and concentric liræ, producing a cancellated surface. *Epidermis* towards and upon the outer margin rather coarsely fibrous. *Colour* dirty-white. *Interior* dull-whitish, rather roughish, exhibiting a kind of shallow pitting or subpunctation. The outer *margin* is thickened, distinctly dentate inferiorly, and crenulate at the sides. The *hinge-teeth* are strongish, in an almost straight series, and number about 8 or 9, of which 2 or 3 more are on the anterior side of the beaks than behind.

The *dorsal area* is narrow, elongate-elliptical, rather deeply concave, of a light-brown colour, and provided with a diamond-shaped central dark-brown *ligament*.

Length, 8·5 mm.; height, 8·5 mm.; diameter, 4·7 mm.

Type in the British Museum.

Hab.—"Challenger" Station 169, off the north-east coast of New Zealand, in 700 fathoms

Remarks.—This little species is peculiar for its width, comparative solidity, and dentate margin, and bears considerable resemblance to *L. minuta*, Philippi.

Genus 2. Lissarca, E. A. Smith, 1877.

Lissarca, E. A. Smith, Trans. Venus Exp. Kerguelen, Moll., 1877, 19. Type: *L. rubrofusca*, E. A. Smith. *Austrosarepta*, Hedley, P.L.S. N.S.W., 1899, 430.

Shell equivalve, very inequilateral, umbones anterior; sculpture concentric, and frequently radial in addition; with an amphidetic internal ligament and a central resilium; hinge-line arched; teeth few, more or less distinctly ⩥-shaped, an edentulous hiatus in the middle; a number of crenulations on the anterior margin.

Distribution.—Antarctic.

Key to Species.

A. Shell ovate; colour purplish-red or brown.
  a. Valves convex, but not inflated, with fine radial striæ .. *aucklandica.*
  aa. Valves ventricose, with fine radiate riblets .. .. *pisum.*
B. Shell transversely trapezoidal; colour light brown or yellowish; beaks close to the anterior end .. .. .. *exilis.*

1. Lissarca aucklandica, E. A. Smith, 1902. Plate 51, figs. 10, 10*a*.

Lissarca aucklandica, Smith, Rep. on Collect. Nat. Hist. "Southern Cross," Moll., 1902, 212, pl. 24, f. 14, 15.

Shell small, equivalve, very inequilateral, convex, purplish-red, almost smooth. *Beaks* not very prominent, approximate, but not quite contiguous, near the *anterior end*, which is short and broadly rounded; the *posterior end* with the dorsal margin slightly raised and convex, the posterior margin sloping, lightly convex, narrowly arched towards the convex basal margin. *Cardinal area* very narrow. *Sculpture* consisting of fine and dense growth-lines, sublamellar posteriorly, and faint fine post-median radiate striæ. *Colour* uniformly purplish-red. *Interior* of the same colour, with faint posterior radiate striæ, not shining. *Margins* strongly denticulate inside, except on the antero-ventral and the posterior median parts. *Hinge-plate* narrow, arcuate, smooth in the middle, with 4 to 5 short anterior and 4 V-shaped posterior *teeth*. *Ligament* very small. *Adductor-scars* unequal, the posterior one longer. *Pallial line* simple.

Length, 4·5 mm.; height, 3·5 mm.; diameter, 2·3 mm. (type).

Type in the British Museum.

Hab.—Auckland Islands, in 10 fathoms.

Remarks.—Closely allied to *L. rubro-fusca*, Smith, from Kerguelen Island, but of a different form, being less oblong, having the umbones less terminal, and the hinge-teeth somewhat different. A faint depression is observable extending from the umbo down the posterior end. (E. A. Smith.)

2. Lissarca exilis, n. sp. Plate 51, fig. 11.

Shell very small, transversely trapezoidal, somewhat ventricose, the beaks anterior, dorsal margin slightly raised, almost smooth, light brown, sometimes radially rayed with white, equivalve, and very inequilateral. *Beaks* slightly raised, tumid and rounded, approximate but not contiguous, situate very near the anterior end, at about the anterior tenth of the length. *Anterior end* short, abruptly descending, and slightly convex; *posterior end* much longer, keeled above, the dorsal margin convexly elevated; anterior margin and posterior part of ventral margin regularly arched, the anterior part of the latter straight. *Area* very small, linear. *Sculpture* consisting of fine concentric growth-lines, crossed by more or less distinct fine radiate striæ. *Colour* light brown to yellowish, very often with a few broad white radial rays. *Interior* of the same colour, not shining, occasionally with a few posterior radiate striæ. *Margins* denticulate, but smooth at the byssal foramen and the upper part of the posterior margin. *Hinge-plate* narrow, arcuate, smooth in the middle, with 3 to 4 short and vertical *teeth* anteriorly, and 3 to 4 oblique teeth on the posterior side. *Ligament* small. *Adductor-scars* inconspicuous, the posterior scar larger than the anterior. *Pallial line* simple.

Length, 3·2 mm.; height, 2·2 mm.; diameter, 2 mm.

Type in my collection.

Hab.—Snares, in 50 fathoms (Captain Bollons).

Remarks.—This species is in the outlines similar to *A. rubro-fusca*, Smith, but it is much smaller, constant in its form, of different colour, and radially striate.

3. Lissarca pisum, n. sp. Plate 51, fig. 12.

Shell small, globosely oval, equivalve, very inequilateral, the beaks anterior, light rufous, with fine radiate riblets. *Beaks* at or near the anterior end, distinct, rounded, approximate, but not touching. *Anterior end* descending almost straight or with a slight curve from the umbo, narrowly convex towards the basal margin; *posterior end* broadly oval, the dorsal margin raised and broadly convex, the posterior margin regularly rounded; anterior part of the basal margin straight. *Area* very small, linear. *Sculpture* consisting of fine radiate costæ, very often indistinct, crossed by fine growth-lines. *Colour* light reddish-brown. *Interior* of the same colour, dull. *Margins* denti-

culate, except at the basal byssiferous foramen and the upper part of the posterior margin. *Hinge-plate* narrow, arcuate, smooth behind the beak, with 5 to 6 short and straight anterior *teeth*, and 5 to 6 oblique, sometimes slightly hooked, posterior teeth. *Ligament* very small. *Adductor-scars* unequal, the anterior smaller. *Pallial line* simple.

Length, 3·5 mm. ; height, 2·8 mm. ; diameter, 2·6 mm.

Type in my collection.

Hab.—Bounty Islands, in 50 fathoms (Captain Bollons).

Remark.—This species is smaller, much more inflated, more distinctly radially striated, and with the beaks much more anterior than *A. aucklandica*.

Fam. **PHILOBRYIDÆ**, Bernard.

Animal like that of *Limopsis*, usually without an anterior adductor muscle. Carnivorous.

Shell small, equivalve, very inequilateral ; anterior end very little developed, or atrophied. Byssus short and thin, passing through a narrow opening between the anterior margins of the valves. Umbones projecting and formed by the embryonic shell or "prodissoconch," straight or slightly curved toward the anterior end (prosogyrate). Umbonal cavity well marked. Ligament internal, or only partly external, median or directed backwards ; area linear, epidermical or absent. Hinge with strong vertical crenellations ; in front and behind this double border of crenellations there are marginal teeth or ridges, which sometimes become obsolete. Test not nacreous, without a prismatic layer, sometimes polished, finely tubular.

Secondary to Recent.

Key to Genera.

A. Beaks always with a prodissoconch ; anterior end but little developed and advancing ; only 1 adductor-scar .. Philobrya.
B. Beaks with or without prodissoconch ; anterior side extending a short distance in front of the beaks ; shell minutely perforated ; 2 adductor-scars .. .. .. Hochstetteria.

Genus 1. Philobrya. P. Carpenter, 1872.

Philobrya, P. Cpr., Smiths. Misc. Coll., x, 1872 ; Bernard, J. de Conch., xlv. 1897, 9. Type : *Bryophila setosa*, Cpr. *Bryophila*, P. Carpenter, 1864 ; preoccupied. *Hochstetteria*, Vélain et Munier-Chalmas, 1876 (in part). *Limarca*, Tate, 1886.

Shell very inequilateral, anterior side very little developed and but little advancing in front of the embryonic shell. Form subquadrangular, elongated in the dorso-ventral direction. Anterior end very short, abruptly truncated ; posterior end continuing the hinge-plate ; ventral margin rounded. Epidermis thick, extending beyond the margins of the valves, and forming hairy riblets, to which may correspond riblets of the shell. There is only 1 adductor-scar in each valve. Beaks close together, surmounted by the prodissoconch, which forms

a well limited and defined disc, occupying a good part of the cardinal line.

Animal viviparous.

An account of the anatomy of *P. sublævis* has been published by Pelseneer in the Voyage du S.Y. "Belgica," Mollusques, 1903, 42, pl. 7, f. 95; pl. 8, f. 96–99.

Distribution.—Cosmopolitan, from the littoral zone to about 200 fathoms.

Fossil in the Secondary and Tertiary: in the Pliocene of New Zealand.

KEY TO SPECIES.

A. Shell very distinctly costate.
  a. Shell triangular, ventricose, with 11 close and grooved costæ *costata.*
  aa. Shell ovate, but slightly ventricose, with 10 carinated costæ *Filholi.*
B. Shell smooth or feebly costate.
  a. Shell, subquadrangular, sometimes mytiliform, with 8–12 faint costæ or smooth; anterior end straight or concave, not advancing .. .. *meleagrina.*
  aa. Shell pyriform, smooth or with faint radial striæ; anterior end advancing a little in front of the beaks .. .. *modiolus.*

1. Philobrya costata, Bernard, 1896. Plate 51, fig. 13.

Hochstetteria costata, Bernard, Bull. des Naturalistes du Muséum, ii, 1896.
Philobrya costata, Bernard, J. de Conch., xlv, 1897, 15, pl. 1, f. 5; 33, f. 7 in text: Bernard, Rech. Ontogén. et Morphol. sur la Coq. des Lamellibranches, 1898, 115, f. 1–5 in text.

Shell small, thick, ventricose, very inequilateral, subquadrangular, strongly radiately ribbed. *Beaks* close together, with a distinct flat and oblique prodissoconch, inclined towards the inner and posterior sides, with a sharp raised margin and slight radial striations. *Anterior end* nearly straight, descending obliquely and forming an angle of 60° to 70° with the dorsal margin. *Posterior end* short and straight or lightly excavated above, very lightly convex at the lower half; basal margin regularly curved. *Lunular area* large, cordiform, flat, with concentric riblets. *Escutcheon* lightly keeled. *Sculpture* consisting of 11 equidistant strong radial ribs, each with a distinct median groove, the interstices near the base almost of the same width as the costæ; to these riblets have to be added 3 to 4 thin simple concentric cords upon the lunular area; the interstices and riblets are ornamented with close wavy and sharp concentric striæ. *Epidermis* produced into double hair-like processes upon the riblets, and extending beyond the margins of the valves. *Colour* light brown. *Interior* light brown, with white radiate rays, corresponding to the interstices on the surface. *Margins* denticulated by the extension of the costæ, and finely crenulate. *Hinge-plate* narrow, with a long crenellated posterior ridge; below the anterior portion of the beak there is a short subquadrangular and cancellated area with 3 roundish small tubercles in front. *Ligament* oblique, below the posterior part

of the umbo, the greater part of it internal, but distinctly visible from the outside. *Adductor-scar* distinct, small and round, posterior. *Pallial line* simple, not very distinct.

Diameter—Ant.-post., 2·5 mm. ; dorso-ventral, 3·2 mm. : thickness, 2·2 mm. : prodissoconch, 0·35 mm. (type).

Type in the Mus. Hist. Nat., Paris.

Hab.—Stewart Island, in 35 fathoms, type (Filhol) ; Whangaroa Harbour (C. Traill) ; Lyttelton Harbour ; Otago Peninsula (T. Iredale) ; Taumaki Island, in 10 fathoms (Captain Bollons) ; Foveaux Strait, in 15 fathoms (A. Hamilton) ; north-east of Wreck Reef, in 50 fathoms, and off south-east of Cape Saunders, in 100 fathoms (E. R. Waite) ; near the Snares and the Bounty Islands, in 50 fathoms (Captain Bollons).

In the littoral zone the shell may be found under stones and on seaweeds.

Remarks.—The species is variable in form, the anterior end sometimes descending almost vertically, and the posterior side being more or less produced.

The Pliocene *P. trigonopsis*, Hutton (*Mytilicardia*), is very nearly allied, but the riblets are finer and more distant, and they are lacking the median groove.

2. **Philobrya Filholi**, Bernard, 1897. Plate 51, figs. 14, 14*a*.

Philobrya Filholi, Bernard, J. de Conch., xlv, 1897, 16; 13, f. 2, *1*; pl. 1, f. 6.

Shell small, solid, equivalve, inequilateral, subquadrangular, slightly ventricose, with distant radiate riblets. *Beaks* close together, with distinct flat prodissoconch, inclined towards the inner and posterior sides, with an elevated convex rim on the outer side, and the centre convexly raised. *Anterior end* slightly convex or straight, forming an angle of 90° with the dorsal margin, which is straight or slightly concave. *Posterior end* slightly convex or straight, forming an obtuse angle with the dorsal margin ; basal margin convex. *Lunular area* cordiform, flat, with concentric riblets. *Posterior part of area* strongly keeled. *Sculpture* consisting of 10 distant radiate riblets, which are carinated, the interstices between them much broader than the costæ ; there are regularly spaced concentric cords, which are very distinct in the interstices, but only feebly imbricating the riblets. *Epidermis* slightly produced at the margins of the valves. *Colour* light-brownish or yellowish-white. *Interior* light brown, rayed with whitish above, smooth. *Basal margin* denticulate and finely crenulate. *Hinge-plate* narrow, with a short oval anterior and a low elongate posterior vertically crenate area. *Ligament* internal, triangular, long. *Adductor-scar* round, small, posterior.

Diameter—Ant.-post., 2·5 mm. ; dorso-ventral, 3·2 mm. : thickness, 2·2 mm. : prodissoconch, 0·35 mm. (type).

Type in the Mus. Hist. Nat., Paris.

Hab.—Stewart Island, in 35 fathoms, type (Filhol); dredged off Otago Heads; Foveaux Strait, in 15 fathoms (A. Hamilton); near the Snares, in 50 fathoms (Captain Bollons); Banks Peninsula (Iredale); Cape Maria van Diemen.

3. **Philobrya meleagrina**, Bernard, 1896. Plate 51, figs. 15, 15*a*.

Hochstetteria meleagrina, Bernard, Bull. des Naturalistes du Muséum, ii, 1896. *Philobrya meleagrina*, Bernard, J. de Conch., xlv., 1897, 12; 11, f. 1, 2; pl. 1, f. 3; Suter, T.N.Z.I., xl, 354.

Shell small, equivalve, inequilateral, rather thin, subquadrangular to ovato-triangular, with faint radial riblets or smooth. Shells living amongst the roots of *Macrocystis* are of somewhat irregular shape, mytiliform, the beaks often much produced. *Beaks* approximate, inclined toward the inner side, frequently produced, with a rather small flat prodissoconch. *Anterior end* abruptly truncated, more or less excavated, forming with the slightly convex dorsal margin an angle of 100° or less. *Posterior end* forming an obtuse angle with the dorsal margin, thence convex or almost straight; basal margin rounded, sometimes broadly angled towards the anterior and posterior end. *Area* smooth, concave in front. *Sculpture* consisting of 8 to 12 faint radiate riblets, but in most examples the valves are smooth and show only incremental lines. *Epidermis* thin, horny, forming imbricating lamellæ, and extending beyond the margins of the valves. *Colour* white or light horny. *Interior* white, smooth, shining. *Margins* smooth and sharp, slightly crenulate when the valves are costate. *Hinge-plate* narrow, with a narrow anterior groove; sometimes, however, in mytiliform specimens the hinge-plate is broad, strong, and the typically long and narrow internal *ligament* is greatly developed, the dorsal and anterior margins much thickened. *Adductor-scar* small, oval, posterior *Pallial line* simple.

Diameter — Ant.-post. 2·5 mm.; dorso-ventral, 2·5 mm.; thickness, 1·1 mm.; prodissoconch, 0·5 mm. (type). Large specimens have an ant.-post. and dorso-ventral diameter of 4·5 mm.

Type in the Mus. Hist. Nat., Paris.

Hab.—Stewart Island, in 35 fathoms, type (Filhol); Bay of Islands (J. C. Anderson); near Cuvier Island, in 38 fathoms (Captain Bollons); Gisborne (A. Hamilton); Banks Peninsula (Iredale); Titahi Bay (Miss Mestayer); off Lyttelton, in 100 fathoms (E. R. Waite); off Otago Heads (A. Hamilton); near Taumaki Island, in 10 fathoms; near the Snares and Bounty Islands, in 50 fathoms (Captain Bollons); Foveaux Strait, in 15 fathoms; Chatham Islands, in roots of *Macrocystis* (Professor H. B. Kirk); Macquarie Island (A. Hamilton).

Remarks.—This is one of the most variable species of the genus I know. The fine riblets are represented by thin radial lines mostly in specimens from deep water, but those found amongst kelp-roots show usually no trace of costæ, but very often deep concentric grooves.

4. Philobrya modiolus, n. sp. Plate 51, fig. 16.

Shell small, equivalve, inequilateral, oblique, pyriform, almost smooth, white. *Beaks* close together, with a small flat and oblique prodissoconch. *Anterior end* receding, straight, angled toward the dorsal margin. *Posterior end* parallel to the anterior, almost straight, with a blunt angle toward the straight dorsal margin; basal margin convex. *Area* keeled in front and behind the beaks. *Sculpture* consisting of concentric growth-lines and very fine distant radial riblets, which are mostly obsolete. *Epidermis* lost in all my specimens. *Colour* white. *Interior* smooth, shining, white. *Margins* thin and smooth, but strongly crenate at the upper posterior end. *Hinge-plate* narrow, the anterior crenate area oval, with a rounded denticle in front, the posterior crenellated area long and narrow. *Ligament* oblique, rather large, internal. *Adductor-scar* small, posterior.

Diameter—Ant.-post., 3 mm.; dorso-ventral, 3 mm.: thickness 2 mm.: prodissoconch, 0·2 mm.

Type in my collection.

Hab.—Near the Bounty Islands, in 50 fathoms (type); Snares, in 50 fathoms (Captain Bollons).

Remarks.—The nearest ally of this species is *P. meridionalis*, E. A. Smith (*Dacrydium*), from Prince Edward and Marion Islands.

Genus 2. Hochstetteria, Munier-Chalmas et Vélain, 1876.

Hochstetteria, Vélain, C.R. Acad. Sc., 1876, (in part); Arch. Zool. Exp., vi, 1877. Type: *H. crenella*, Vélain.

Shell small, inequilateral, the anterior side shorter than the posterior, but extending some distance in front of the beaks, regularly rounded, mytiliform. Epidermis thin, without riblets or processes. Shell perforated by minute tubules. Hinge-plate somewhat narrowed between the 2 crenated areas. Ligament in a median fossette. There are 2 adductor-scars. Prodissoconch distinct or absent.

The animal is most likely viviparous.

Of this genus only five species have been recorded—two from the Islands of St. Paul and Amsterdam; two from Port Alfred, Cape Colony; and one from New Zealand.

1. Hochstetteria trapezina, Bernard, 1897. Plate 51, figs. 17, 17*a*.

Hochstetteria trapezina, Bernard, J. de Conch., xlv, 1897, 18; 17, f. 3, *l*; pl. 1, f. 7: Hedley, Rec. A.M., v, 1904, 89. *Myrina minuta*, E. A. Smith, P. Mal. S., iii, 1898, 24; f. 4, p. 22. *Adula minuta*, Smith, Index, 94.

Shell very small, transverse, much produced posteriorly, subquadrangular. *Beaks* very close together, the prodissoconch elongate and considerably raised upon the definitive shell. *Anterior end* much produced beyond the beaks; *posterior end* truncated; ventral margin almost parallel to the dorsal. *Sculpture* consisting of numerous close and faint radial riblets, very often obsolete, and concentric growth-

lines. *Colour* pale fuscous or reddish. *Interior* smooth, shining, faintly rayed. *Hinge* with 1–2 anterior and 4–5 posterior marginal teeth. *Ligament* in a triangular resilifer, which is wide and extended on both sides. *Margins* on the ventral and posterior sides distinctly crenate, the crenatures resembling the marginal teeth.

Diameter — Ant.-post., 1·5 mm.; dorso-ventral, 1·1 mm.: thickness, 1 mm.: prodissoconch, 0·4 mm. (type).

Type in the Mus. Hist. Nat., Paris.

Hab.—Stewart Island, in 35 fathoms, type (Filhol); near the Bounty and Snares Islands, in 50 fathoms (Captain Bollons); Shag Point and Otago Peninsula (Iredale); Foveaux Strait, in 15 fathoms; Taumaki Island, in 10 fathoms (Captain Bollons); Lyttelton Harbour, on seaweeds (H. S.); Lyall Bay.

Suborder 3. MYTILACEA.

Symmetrical *Pelecypoda* in which the anterior adductor muscle is always less developed than the posterior (the "anisomyarian" condition) or is absent. The heart gives off a single vessel only, the anterior aorta. The gills are smooth, the gill-filaments all alike and provided with interlamellar junctions. The gonads externally extend into the mantle, and open at the sides of the kidneys. The foot is linguiform and byssiferous.

Shell usually equivalve, not alate or notched for a byssus, edentulous or with teeth evidently derived from external sculpture impinging upon the hinge-line (dysodont). Shell-substance subnacreous, rarely more or less prismatic. Epidermis conspicuous. Ligament parivincular, usually opisthodetic and external.

Mostly marine.

Fam. MYTILIDÆ, Fleming.

Animal having the mantle-lobes united below the anal siphon, otherwise free; generally byssiferous. Cephalic eyes present.

Shell inequilateral, the anterior side being short, equivalve, heteromyarian, slightly gaping, typically dysodont; area amphidetic or none; ligament usually external, deep-seated; rarely with an alivincular internal resilium; pallial line simple.

Devonian to Recent.

Key to Genera.

A. Shell oblong, cuneiform.
  a. Beaks terminal, usually with teeth at the beaks .. Mytilus.
  b. Beaks not terminal, no teeth at the beaks .. .. Modiolus.
B. Shell rhomboidal, with 3 areas, the median usually smooth, the others ribbed .. .. Modiolaria.
C. Shell oblong, subcylindrical; hinge-plate very narrow and smooth .. .. Lithophaga.
D. Shell oval, trapezoidal, higher than long; hinge-plate plicated on both sides .. .. Dacrydium.

Genus 1. Mytilus (Linné), Bolten, 1798.

Mytilus, L., Syst. Nat., ed. 10, 1758, 704; Bolten, Mus. Bolten., 1798, 157. Type: *M. edulis*. L.

Animal with an elongated linguiform foot; byssus well developed; margins of the mantle thick, papillate, fringed posteriorly at the branchial opening, but smooth at the anal orifice; branchiæ nearly equal; labial palpes elongated, free.

Shell equivalve, cuneiform, very inequilateral; umbones acute, terminal and anterior; posterior margin rounded; cardinal teeth small, or obsolete; ligament linear, marginal, deep-seated; interior of the valves commonly lined with nacreous matter; anterior adductor of the valves small, posterior very large.

Distribution.—Cosmopolitan, the maximum of species in Arctic and Antarctic seas. Abundant and gregarious from high-water mark to a depth of a few fathoms on rocky, stony, or muddy bottom.

Fossil from the Trias to Tertiary.

Vernacular Name.—Mussel.

Key to Subgenera.

A. Shell smooth.
  a. Hinge with 3 to 5, rarely only 2 teeth; anterior adductor-scar present; 2 byssal scars united with the posterior adductor-scar .. .. Eumytilus.
  b. Hinge with 1 to 2 teeth; no anterior adductor-scar; anterior and median byssal scars isolated .. .. Chloromya.
B. Shell ribbed. Hinge without definite teeth .. .. Aulacomya.

Subgen. 1. Eumytilus, von Ihering, 1900.

Eumytilus, von Ihering, P. Mal. S., iv, 1900, 86; Jukes-Browne, *l.c.*, vi, 1905, 217. Type: *Mytilus edulis*

Anterior side with a small ribbed expansion under the umbo, the margin of which bears several small teeth, generally from 3 to 5, but sometimes only 2; these teeth vary in size and number, even in the same species. Anterior adductor-scar always present, the median and posterior byssal scar united to one another and to that of the posterior adductor. Surface smooth, or concentrically sculptured.

1. Mytilus edulis, Linné, 1758. Plate 56, fig. 4.

Mytilus edulis, L., Syst. Nat., ed. 10, 1758, 705; Forbes and Hanley, Brit. Moll., ii, 170; Conch. Icon., x, f. 33; von Ihering, P. Mal. S., iv, 88; E. A. Smith, *l.c.*, v, 163; Hutton, M.N.Z.M., 167. *M. chorus*, Molina: Filhol, Miss. I.C., 544. Hutton, P.L.S. N.S.W., ix, 529; not of Molina. *M. Dunkeri*, Reeve: Hutton, C.M.M., 77; J. de Conch., 1878, 52; not of Reeve.

Shell attaining sometimes a large size, oblong-oval or triangular, dilated behind, the beaks anterior and terminal, smooth. *Beaks* slightly uncinate, close together. *Anterior end* narrowed, pointed, and

usually somewhat inflated, the dorsal margin ascending on the anterior half, the posterior part broadly rounded or almost straight. *Posterior end* regularly convex, the basal margin straight or more or less concave. *Sculpture* consisting of fine concentric growth-lines and very fine radiate striæ; under the beaks a small triangular area with prominent ribs corresponding with the hinge-teeth. *Epidermis* thin, dark olive-brown. *Colour* deep blackish-blue, sometimes whitish-yellow with brown at the anterior basal part. *Interior* bluish-white, black outside the pallial line, polished. *Margins* smooth and sharp. *Hinge-plate* narrow, oval, with 3 or 4 teeth in each valve, which may be reduced to 2 or 1. *Ligament* external, long and strong, deep-seated. *Adductor-scars* 2, the anterior very small, behind the umbo; the posterior large, roundish, situate at the upper part of posterior end, and confluent with the long and narrow byssus retractor scar; the anterior retractor scar of the foot is small, oblong, on the dorsal side behind the beak. *Pallial line* simple. *Byssus* consisting of a round stalk, from which on all sides the threads of attachment are given off.

Diameter.—Ant.-post., 50 mm. to 120 mm.; dorso-ventral, 25 mm. to 67 mm.: thickness 17. mm. to 40 mm.

Anatomy.—Alex. Purdie, "Studies in Biology for New Zealand Students," No. 3, 1887.

Hab.—Throughout New Zealand, but more common in the south. Auckland and Campbell Islands.

The species is abundant around the coasts of the North Atlantic, and in the Mediterranean; Strait of Magellan to St. Catharina, Brazil, and extending on the west coast of America to California; Falkland Islands; Kerguelen Island. It is not recorded from Tasmania and Australia.

Remarks.—Specimens from our subantarctic islands are of a very large size. The animal is used as food and for bait. These mussels, like those of other species, contain sometimes pearls of an inferior quality.

Fossil in the Pliocene and Pleistocene of Europe and northern parts of America, and in the Miocene and Pliocene of New Zealand.

Subgen. 2. Chloromya, Mörch, 1853.

Chloromya, Mörch, Cat. Conch. Yoldi, pt. 2, 1853, 51; von Ihering, P. Mal. S., iv, 87; Jukes-Browne, *l.c.*, vi, 218. Type: *Mytilus perna*, L.

Umbones more completely terminal, and the anterior side inflexed so as to form a small hinge-plate below the umbo. Shell always smooth. Riblets of anterior side short, and sharply inflexed beneath umbo. Teeth 1–2 or 2–2; most frequently the former, but the single tooth is sometimes in the right, sometimes in the left valve. No anterior adductor-scar; byssal scars 3—an anterior, a median, and a posterior—the latter united to the posterior adductor.

2. **Mytilus canaliculus**, Martyn, 1784. Plate 56, fig. 5.

Mytilus canaliculus, Martyn, Un. Conch., ii, 1784, f. 78; Hanley, Cat. Rec. Biv. Shells, 248. *M. smaragdinus*, Chemn.: Hutton, C.M.M., 77; not of Chemnitz. *M. latus*, Lam.: C.M.M., 78; not of Lamarck. *M. latus*, Chemnitz: Hutton, J. de Conch., 1878, 52; M.N.Z.M., 167; P.L.S. N.S.W., ix, 529; Index, 94; not of Chemnitz.

Shell attaining a large size, wedge-shaped, oblong, base flattened, with a distinct angle extending from the umbo to the lower end of the posterior margin, with concentric growth-lines, yellowish-green. *Beaks* distant, sharply pointed, and curved downward. *Anterior end* sharply pointed, the anterior part of the dorsal margin ascending, convex, and forming an obtuse angle with the posterior, slightly descending, and convex part of the margin. *Posterior end* compressed, regularly convex; the basal margin concave at its posterior half. *Sculpture* consisting of numerous fine concentric growth-lines, crossed by very fine and dense radial striæ; well-preserved specimens usually show concentric ridges composed of numerous sharply pointed triangular and but slightly raised areas; triangular area below the beaks with several sharply raised and interlocking ribs. *Epidermis* thick, horny, lightly shining. *Colour* usually yellowish-green, sometimes light yellowish-brown on the base, dark and bright green with numerous brown radial rays on the upper parts; young shells are mostly light yellow, with an elliptical brown area on the anterior part of the base, and with bright green on the anterior upper end. *Interior* purplish-white, iridescent. *Margins* smooth, sharp, the epidermis extending some distance beyond them. *Hinge-plate* moderately broad, curved, with 1 or 2 sharp teeth. *Ligament* external, but very deep-seated, and of considerable length. *Adductor-scar* only 1, posterior, large and oval; 3 byssus *retractor scars*, the anterior narrow and oblong, above the beaks, the median below the dorsal angle, and the posterior in front and above the adductor-scar, both united. *Pallial line* simple.

Diameter — Ant.-post., 172 mm.; dorso-ventral, 70 mm.: thickness, 53 mm. (a fairly large specimen).

Anatomy.—Alex. Purdie, as quoted for *M. edulis*.

Hab.—Throughout New Zealand, on exposed rocks and wharf-piles, and in deeper water, where frequently the roots of *Macrocystis* are fixed on it. Kermadec Islands. Also Tasmania. Brought to England by Captain Cook.

Remark.—According to my observations, this species will grow to a length of about 50 mm. on the wharf-piles in Auckland Harbour in one year.

Maori.—Kuku, kutai (*fide* Captain Bollons).

Fossil in the Miocene and Pliocene.

Subgen. 3. AULACOMYA, Mörch, 1853.

Aulacomya, Mörch, Cat. Conch. Yoldi. pt. 2, 1853, 53; von Ihering, P. Mal. S., iv, 87; Jukes-Browne, *l.c.*, vi, 218. Type: *Mytilus magellanicus*, Lam.

Shell always ribbed or furrowed. Umbones terminal, elongated, and often projecting beyond and in front of the anterior side, which

has only a single riblet twisted in under the umbo. Ligament long and carried in a channel beneath the umbones. Hinge without definite teeth, but having a tooth-like ridge in one valve which fits into a groove or depression on the other valve. Anterior adductor often absent, but other scars as in *Eumytilus*.

3. Mytilus magellanicus, Lamarck, 1819. Plate 56, fig. 6.

Mytilus magellanicus, Chemnitz, Conch. Cab., viii, pl. 83, f. 742; not binomial: Lamarck, A.s.V., vi, 1819, 119; Conch. Icon., x, pl. 6, f. 22; Hanley, Cat. Rec. Biv. Shells, 244; M.N.Z.M., 166; E. A. Smith, Chall. Rep., xiii, 272; Chenu, Man. Conch., ii, 152, f. 746; Pelseneer, Voy. "Belgica," 10; Melvill and Standen, Scot. Antarct. Exp., 145. *M. polyodontes*, Q. & G.: Gray, Dieff. N.Z., 259; not of Quoy and Gaimard. *M. capensis*, Dunker, in Menke's Zeitschr. f. Malak., 1846, 108. *M. crenatus*, Lamarck: Krauss, die Südafrik. Moll., 1848, 24; not of Lamarck.

Shell not very large, oblong, subtrigonal, distinctly angled, thick, longitudinally ribbed, black. *Beaks* acute, slightly curved, rather close together; in young specimens the partly smooth embryonic shell can distinctly be seen. *Anterior end* pointed, inflated, the dorsal margin ascending straight to the middle of the length, whence it is slowly descending. *Posterior end* somewhat compressed, regularly rounded; basal margin straight or slightly concave. *Sculpture* consisting of thick raised undulating ribs, bifurcating toward the margins, and crossed by concentric lines and ridges, which render the ribs more or less granulose. *Epidermis* thick, brown or black. *Colour* white at the beaks, the remainder purplish-black or maroon. *Interior* purplish-white, or white, iridescent. *Margins* crenated or smooth. *Hinge-plate* small and short, with ridge and groove. *Ligament* external, but deep-seated, and with an upper channel, the sides of which are grooved. The anterior *adductor-scar* is usually present, small and oval; the posterior adductor-scar is large, oval and united with the byssus-scars. *Pallial line* simple.

Diameter—Ant.-post., 82 mm.; dorso-ventral, 42 mm.: thickness, 32 mm.

Anatomy.—Alex. Purdie, as quoted for *M. edulis*.

Type in the Mus. Hist. Nat., Geneva.

Hab.—Rare on the shores of the North Island, but more common south of Cook Strait. Chatham, Auckland, and Campbell Islands.

The species is circumaustral. Recorded from the Fiji Islands, Kerguelen Island, South Africa, Falkland Islands, Tierra del Fuegia, Patagonia east and west, Chile, Peru.

Fossil in the Miocene and Pliocene.

Genus 2. Modiolus, Lamarck, 1799.

Modiolus, Lamarck, Mém. Soc. Hist. Nat., Paris, 1799, 87. Type: *Mytilus modiolus*, L. *Modiola*, Lamarck, Syst. A.s.V., 1801, 113; Jukes-Browne, P. Mal. S., vi, 218.

Shell oblong or elongate, oblique, generally inflated toward the anterior side, and often compressed on the posterior side. Smooth

or concentrically striated, seldom ribbed, but in some species feebly striated on the posterior slope. Umbones obtuse, anterior, but seldom terminal. Anterior margin expanded in front of the umbones, but quite smooth. Hinge-line without teeth or crenulations. Anterior adductor-scar larger than in *Mytilus;* posterior scars united, the byssal portion long and narrow, the adductor part rounded and not bulging upwards as in *Mytilus.*

Distribution.—About seventy species in all seas; a few species are living in fresh water.

Fossil in the Secondary and Tertiary.

Vernacular Name.—Horse-mussel.

Remarks.—The animals of this genus have the habit of nestling in a mass of byssal fibres with extraneous entangled material. In some deep-water species a real nest is spun, like that of *Lima*, but more dense. (W. H. Dall.)

KEY TO SPECIES.

A. Beaks almost terminal. Shell intensely black, not much winged posteriorly .. .. *ater.*
B. Beaks a short distance from the anterior end.
a. Shell smooth, blackish, small .. .. *fluviatilis.*
b. Shell hirsute, brown, attaining a relatively large size .. *australis.*

1. Modiolus ater, Zelebor, 1866. Plate 58, fig. 4.

Mytilus ater, Zelebor, Verh. Zool. Bot. Ges., Wien, xvi, 1866, 914; Frauenfeld, Reise der "Novara," Zool., ii, Moll., 16, pl. 2, f. 30; M.N.Z.M., 167. *Volsella ater*, Frauenfeld: Suter, T.N.Z.I., xxiv, 223; Index, 94. *Perna confusa*, Angas, P.Z.S., 1871, 21, pl. 1, f. 33. *Mytilus crassus*, T.-Woods, P.R.S. Tas., 1876 (1877), 157. *Modiola ater*, Zelebor: Pritchard and Gatliff, P.R.S. Vic., xvii (n.s.), 249.

Shell small, moderately solid, smooth and shining, black, inflated, with a blunt carina extending from the upper part of the umbo to the posterior part of the basal margin. *Beaks* blunt, close together, very near the anterior end, usually devoid of epidermis, pearly. *Anterior end* narrowed, inflated, the dorsal margin ascending, straight, forming a blunt angle with the posterior straight and descending portion. *Posterior end* rounded, obtusely angled above and below, somewhat compressed; basal margin straight or concave at the anterior third. Posterior part of the *area* concave. *Sculpture* consisting of concentric growth-lines. *Epidermis* coriaceous, black, shining, turned over at the margins. *Colour* intense black, bluish where part of the epidermis has been rubbed off. *Interior* brownish-blue or bluish-white, slightly iridescent. *Margins* smooth, sharp. *Hinge-line* triangular, smooth, narrow. *Ligament* long and narrow, almost entirely internal. Anterior *adductor-scar* rather long and narrow; posterior adductor-scar round and united with the long and narrow byssus-scar. *Pallial line* distinct, slightly indented.

Diameter—Ant.-post., 25 mm. ; dorso-ventral, 12 mm. : thickness, 13 mm. A large specimen from the Auckland Islands measures 49 mm. by 20 mm. by 23 mm.

Type in the K.K. Hofmuseum, Vienna.

Hab.—Throughout New Zealand. Auckland Islands.

2. **Modiolus australis**, Gray, 1827. Plate 58, fig. 5.

Modiola australis, Gray, App. to King's Voyage, ii, 1827, 477 ; Hanley, Cat. Rec. Biv. Shells, 235 ; Conch. Icon., x, pl. 5, f. 21 ; M.N.Z.M., 168 ; Pritchard and Gatliff, P.R.S. Vic., xvii (n.s.), 251. *Perna australis*, Gray : Angas, P.Z.S., 1865, 653. *Volsella australis*, Gray, Index, 94. *Mytilus* (*Modiola*) *areolatus*, Gould, P. Bost. S.N.H., iii, 1850, 343 ; U.S. Expl. Exp., xii, 452, atlas f. 562.

Shell moderately large, rather solid, transversely ovate, hirsute, brown, with a rather large ventral byssal fissure. *Beaks* very near the anterior end, somewhat distant, tumid, obtusely angular. *Anterior end* swollen, much narrowed, narrowly convex, the dorsal margin rectilinear, ascending, gradually curving at about half its length. *Posterior end* compressed, broadly rounded, the ventral margin concave near the beaks ; a constriction running from the posterior end of the byssal fissure to the beaks marks off a triangular segment of darker colour. *Sculpture* consisting of fine concentric growth-lines, crossed by very fine radial striæ ; triangular segment with numerous short, arrow-headed, radiating undulations. *Epidermis* coriaceous, shining, produced into long beard-like fringes on the posterior half of the shell. *Colour* chestnut-brown, paler along the umbonal ridge. *Interior* cream-colour, livid around the ligament, the dorsal portion flesh-coloured. *Margins* smooth, sharp. *Hinge-line* very narrow, smooth. *Ligament* fairly long, mostly internal. *Adductor-scars* but faintly impressed. *Pallial line* simple.

Diameter—Ant.-post., 44 mm. ; dorso-ventral, 26 mm. : thickness, 20 mm. A large specimen from Stewart Island measures 108 mm. by 60 mm by 45 mm.

Type in the British Museum.

Hab.—Throughout New Zealand. Chatham, Auckland, and Campbell Islands. Also Tasmania and Australia.

Maori.—Purewha.

Fossil in the Miocene and Pliocene.

3. **Modiolus fluviatilis**, Hutton, 1878. Plate 58, fig. 6.

Modiola securis, Lamarck : Hutton, C.M.M., 78 ; not of Lamarck. *M. fluviatilis*, Hutton, J. de Conch., 1878, 53 ; M.N.Z.M., 168 ; P.L.S. N.S.W., ix, 530. *Volsella fluviatilis*, Hutton, Index, 94.

Shell small, transversely ovate, inflated, with a blunt umbonal carina, concentrically ridged, black. *Beaks* near the anterior end, but farther back than in *M. ater*, fairly close together, tumid, carinated, the carina extending to the posterior end of the basal margin. *Anterior end* narrowed, swollen, narrowly rounded, the dorsal margin ascending,

straight to its middle, thence descending in a regular curve. *Posterior end* compressed, broadly rounded, the basal margin slightly concave at the middle. *Sculpture* consisting of concentric growth-lines. *Epidermis* coriaceous, slightly shining, brown. *Colour* brownish-black. *Interior* bluish-white, purple round the dorsal and posterior margins. *Margins* smooth, sharp. *Hinge-line* narrow, smooth. *Ligament* long and narrow, mostly internal. *Adductor-scars* distinct, but hardly impressed. *Pallial line* simple.

Diameter—Ant.-post., 25 mm.; dorso-ventral. 13 mm.: thickness, 12 mm.

Type in the Dominion Museum, Wellington.

Hab.—In brackish water throughout New Zealand. The type is from the Great Lagoon, Chatham Islands.

Remarks.—This species is nearly allied to *M. ater*, but the beaks are situate farther back, the shell is generally less curved, and the colour is not so intensely black, more brownish. It is, as a rule, much more winged posteriorly.

Genus 3. Modiolaria, Beck, 1840.

Modiolaria, Beck, in E. Robert, Zool. Voy. "Récherche" en Isl. et en Grönl., pl. 17, f. 1–4, 1840. Type: *Mytilus discors*, L. *Modiolaria*, Lovén, Ind. Moll. Scand., 1846, 33. *Lanistes*, Swainson, Malac., 1840, 385; not of Montfort, 1810. *Lanistina*, Gray, P.Z.S., 1847, 199.

Animal having the mantle widely open; siphons elongated, the branchial one being usually shorter and not closed along its lower side, but merely with apposited free edges. Foot long and tapering to a point, vermiform, grooved, and with a byssiferous gland.

Shell rhomboidal, inflated, generally with 3 areas, the two at the ends radially sculptured; sometimes the shell is radiately ribbed throughout, or it may be smooth; beaks incurved, placed near the anterior end. Ligament linear, marginal. Hinge-plate smooth or crenate.

Distribution.—All seas; several species in cold seas.

Fossil.—Secondary and Tertiary.

Key to Species.

A. Shell small, elongately ovate, with fine radial riblets, strongly sericate posteriorly .. .. *barbata.*
B. Shell larger, ovate and ventricose, with stout radial ribs, not sericate *impacta.*

1. Modiolaria barbata, Reeve, 1858. Plate 63, fig. 3.

Lithodomus barbatus, Reeve, Conch. Icon., x, pl. 5, f. 27. *L. laniger*, Reeve, *t.c.*, pl. 5, f. 30. *Modiolaria barbata*, Reeve: Angas, P.Z.S., 1867, 911, pl. 44, f. 12. *Crenella barbata*, Reeve: Angas, *l.c.*, 1878, 871. *Modiolaria lanigera*, Reeve: E. A. Smith, Chall. Rep., xiii, 278. *M. barbata*, Reeve, Index, 94; Pritchard and Gatliff, P.R.S. Vic., xvii (n.s.), 254.

Shell small, thin, transversely ovate, hirsute posteriorly, thin, light yellow. *Beaks* approximate, near the anterior end, tumid, angled,

the broadly rounded angle running to the posterior end of the basal margin. *Anterior end* convex, slightly excavated beneath the umbones, the dorsal margin almost straight and horizontal. *Posterior end* narrowly rounded, slightly compressed; basal margin slightly concave at the posterior third. *Sculpture* consisting of fine radiate riblets, anteriorly under the beaks, posteriorly from a little in front of the dorsal lateral ridge; median areas smooth, except for growth-lines. *Epidermis* thin, shining, yellowish, produced posteriorly into long thin bristles. *Colour* light yellow. *Interior* white, iridescent, showing the external sculpture distinctly. *Margins* crenate, but smooth at the base where the byssus passes. *Hinge-plate* short, crenate, broadening anteriorly. *Ligament* long, narrow, the greater part internal. *Adductor-scars* not much impressed. *Pallial line* continuous, simple.

Diameter—Ant.-post., 10 mm.; dorso-ventral, 5 mm.: thickness, 5 mm.

Type in the British Museum.

Hab.—North Island: Bay of Islands, Hauraki Gulf. Also Tasmania and Australia.

2. Modiolaria impacta, Hermann, 1782. Plate 58, fig. 7.

> *Mytilus impactus*, Hermann, Naturforscher, xvii, 1782, pl. 3, f. 5–8; Wood, Index Test., 1825, 59, pl. 12, f. 40. *Modiola impacta*, Herm.: Hanley, Cat. Rec. Biv. Shells, 241; Conch. Icon., x, pl. 9, f. 64. *Crenella impacta*, Herm., M.N.Z.M., 168. *Modiolatia impacta*, Herm., Conch. Cab., 1889, 147, pl. 34, f. 9. *Modiola discors*, Lamarck, A.s.V., vi, 1819, 114; not of Linné. *Crenella discors*, Lam., C.M.M., 78. *Modiolarca impacta*, Herm., Dieff. N.Z., 259.

Shell fairly large, oval, ventricose, with anterior and posterior strong radial ribs, thin but solid, olive to green and yellow. *Beaks* nearly terminal, approximate, slightly hooked, rounded, with an indistinct angle running to the posterior end. *Anterior end* broadly convex, ventricose, dorsal margin convexly raised at the middle. *Posterior end* narrowly rounded and somewhat produced below; the basal margin horizontal, lightly convex. *Sculpture:* A few distant strong and broad radiate ribs, the interstices each with a much narrower rib at the anterior end, and numerous similar ribs at the posterior end, the intermediate area usually devoid of radial sculpture; the whole surface with concentric growth-lines. *Epidermis* coriaceous, slightly shining, yellowish-olive. *Colour* brown, reddish-ash to olive, sometimes yellow at the edge above, and green below. *Interior* whitish, with concentric purple bands, iridescent, showing the radial sculpture. *Margins* crenate anteriorly and posteriorly, smooth at the middle of the base. *Hinge-plate* narrow and short, indistinctly crenate, terminating in a point behind. *Ligament* rather short, narrow, the greater part internal. Posterior *adductor-scar* large, round, superficial. *Pallial line* continuous, simple.

Diameter — Ant.-post., 42 mm.; dorso-ventral, 27 mm.: thickness, 25 mm.

Hab.—North and South Islands of New Zealand. Chatham Islands. Also Australia. Brought to England by Captain Cook. From low-water mark to about 25 fathoms, between boulders and rocks; usually a number of shells in a nest of byssus threads.

Fossil in the Pliocene.

Genus 4. Lithophaga, Bolten, 1798.

Lithophaga, Bolten, Mus. Bolten. (2), 1798, 156. Type: *Mytilus lithophagus*, L. *Lithophagus*, Megerle, Entwurf, 1811, 69. *Lithodomus*, Cuvier, Règne An., ii, 1817, 471. *Leiosolenus*, Carpenter, Mazatlan Cat., 1856, 130. *Myoforceps*, Fischer, Man. Conch., 1886, 969.

Animal as in *Mytilus*; the foot short, byssiferous.

Shell equivalve, transverse, oblong, subcylindrical, rounded in front, with an epidermis, very inequilateral. Beaks anterior, not much produced; anterior end rounded, posterior end rostrate or cuneiform; hinge-plate linear, without teeth; ligament marginal, internal; interior with a thin nacreous layer; outer layer of shell of tubular structure.

Distribution.—About twenty-five species from the Gulf of Gascogne, Mediterranean, Antilles, Indian Ocean, Pacific, New Zealand.

Fossil in the Secondary and Tertiary.

Remarks.—The young shells are fixed by their byssus, but later on they begin to bore into shells and rocks, the excavation being of the same shape as the shell, and allowing no rotatory movement. The animal is phosphorescent.

One species, *L. striata*, Hutton, is recorded from the Pliocene of Wanganui.

1. Lithophaga truncata, Gray, 1843. Plate 58, fig. 8.

Lithodomus truncatus, Gray, Dieff. N.Z., 259; C.M.M., 79; Crit. List, 48; Conch. Icon., x, f. 3; Ereb. & Ter., 6, pl. 2, f. 12; M.N.Z.M., 168. *Lithophaga truncata*, Gray, Index, 94.

Shell oblong, subcylindrical, equivalve, inequilateral, thin, dark brown, shining. *Beaks* prominent, near the anterior end, close together, swollen and inflexed. *Anterior end* short, ventricose, convex, the dorsal margin first lightly convex, then straight; from the inner side of the umbones a low ridge runs down to the posterior end of the basal margin. *Posterior end* produced and tapering, narrowly rounded; basal margin concave on its anterior half, slightly convex behind. Anterior *area* short, slightly excavated under the beaks; posterior area narrowly and elongately lanceolate, deep behind the beaks. *Sculpture* consisting of concentric striæ and ridges, and a few radiate lines below the umbones. *Epidermis* brown, thick and persistent, polished.

Colour uniformly dark chestnut. *Interior* bluish-white, purplish at the posterior end, faintly shining, and very slightly pearly. *Margins* smooth, sharp, the epidermis bent over them. *Hinge* linear, smooth. *Ligament* about one-third of the length of the valves, internal, but little of it visible from the outside. Anterior *adductor-scar* elongate, the posterior scar round and united above with the narrow and short byssus retractor scar. *Pallial line* simple.

Diameter—Ant.-post., 36 mm.; dorso-ventral, 15 mm.: thickness, 16 mm.

Type in the British Museum.

Hab.—North and South Islands. Boring in hard rocks between tide-marks; sometimes it is boring into the massive shells of *Glycymeris laticostata.*

Genus 5. Dacrydium, Torell, 1859.

Dacrydium, Torell, "Spitzbergen's Molluskenfauna," 1859, 138. Type: *Modiola* (?) *vitrea*, Möller.

Animal with the ventral side open; foot byssiferous.

Shell oval, trapezoidal, very short anteriorly, dilated posteriorly; surface generally smooth; beaks contiguous; margins simple; ligament internal in a triangular resilifer under the beaks; hinge fairly strong, deeply plicated on both sides, convex below, interrupted under the beaks; impression of the anterior adductor lanceolate and marginal, of the posterior adductor suboval.

Distribution.—Arctic and Antarctic seas; Atlantic; Australasia: in depths to about 2,500 fathoms.

Remarks.—The animal of *Dacrydium* lives in an elongated tubular nest woven of byssus threads and covered by *Foraminifera*, spicules of sponges, &c.

Key to Species.

A. Shell smooth	*Pelseneeri.*
B. Shell radially finely ribbed	*radians.*

1. Dacrydium Pelseneeri, Hedley, 1906. Plate 51, fig. 18.

Dacrydium Pelseneeri, Hedley, T.N.Z.I., xxxviii, 1905 (1906), 72, pl. 2, f. 8.

Shell small, thin, translucid, with a nacreous lustre, oblong inflated, straight on the anterior side, rounded dorsally and ventrally, almost angled at the anterior dorsal corner. *Umbo* slightly projecting. *Sculpture* regular-spaced elevated growth-lines. A thin membranous *epidermis* clothes the valve. *Hinge* with a few anterior teeth, and a long row of posterior teeth, which increase in size as they recede from the chondrophore.

Height, 2·2 mm.; length, 1·48 mm.

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms; a pair of valves.

Remarks.—The species appears to differ from *D. albidum*, Pelseneer, by its rough surface and by its greater length in proportion to height.

From its nearer ally *D. fabale*, Hedley, it differs by the straight edge of the anterior margin, and by being smaller and proportionally shorter. (Hedley.)

2. **Dacrydium radians**, Suter, 1908. Plate 51, figs. 19, *a*.

Dacrydium radians, Suter, T.N.Z.I., xl, 1907 (1908), 355, pl. 27, f. 11.

Shell small, equivalve, inequilateral, inflated, oblong and very high, semitransparent, thin and fragile, radially finely ribbed. *Beaks* very small, rounded, directed forwards; prodissoconch small, broadly ovate, concentrically very finely striated. *Anterior end* vertical, straight, dorsally sharply rounded. *Posterior end* moderately convex, its dorsal margin sloping and straightened; basal margin acutely convex. Lunular area broadly flattened. *Sculpture* consisting of numerous fine flatly rounded radial riblets of equal strength and equidistant; the interstices of the same width as the riblets; these are crossed by fairly regularly spaced distant concentric sharp ridges. *Colour* white. *Interior* slightly nacreous, showing the radial sculpture. *Margins* minutely crenulate. Posterior *hinge-plate* narrow, straight, sloping, with numerous small plications, slightly increasing in size as they recede from the resilifer; the anterior hinge-plate beginning with a small tubercle behind the beak, narrower than the posterior plate, curved, with numerous small plications. *Ligament* internal, small. Anterior *adductor-scar* beneath the dorsal margin, oval and high; posterior scar at the end of the hinge-plate.

Length, 3·5 mm.; height, 5·5 mm.; diameter, 1·6 mm. of the largest valve.

Type in my collection.

Hab.—Five miles south of Cuvier Island, in 38 fathoms (Captain Bollons).

Suborder 4. PECTINACEA.

Pelecypoda with an open mantle and devoid of an anterior adductor muscle. The gills are folded, and the filaments at the summits and bottoms of the folds are different from the others. The gonads are contained in the visceral mass, and generally open into the kidneys. Foot usually rudimentary, subcylindrical, grooved, and byssiferous. Mantle-lobes free, without siphons, usually with ocelli, papillæ, or other tactile prominences along the margin, and with an inner projecting lamina (curtain) near the margin, at right angles to the plane of the valves. Pallial line simple.

Shell usually inequivalve, flabelliform, more or less auriculate, and monomyarian; shell-structure subnacreous, corrugated, and rarely prismatic, occasionally tubular; area, when present, amphidetic; ligament amphidetic, alivincular.

Animals marine.

Fam. PECTINIDÆ, Lamarck.

Animal having an elongated, tongue-shaped, byssiferous foot ; the ocelli are numerous and well developed ; hermaphrodite or dicœcious.

Shell inequivalve, inequilateral, auriculate, mostly closed, monomyarian, usually free ; area amphidetic or obscure ; ligament obsolete externally, the immersed portion forming an internal resilium ; hinge with a few lamelliform divergent and symmetrical teeth, mostly feeble or not developed.

Silurian to Recent.

Genus 1. PECTEN, Müller, 1776.

Pecten, Müller, Prodr. Zool. Dan., 1776, 248. Type : *Ostrea maxima*, L.

Animal having the labial palps pectinated within, the liver arborescent, branchial leaflets equal, semicircular, rectum and anus free and extending beyond the adductor muscle ; muscular system asymmetrical ; tentacular filaments of the mantle elongated ; byssal gland more or less developed.

Shell suborbicular, auriculate, ornamented by radiating costæ ; right valve typically convex, inflated and produced in the umbonal region, which curves inwards ; left valve typically flat, and smaller than the other, but in certain sections of the genus it is subequal and convex ; cardinal line straight ligamental pit commonly triangular, internal.

Distribution.—World-wide in numerous species.

Fossil in the Secondary and Tertiary.

Vernacular Name.—Scallop.

KEY TO SUBGENERA.

A. Shell usually rather large ; the right valve convex, the left flat ; ears subequal	PECTEN.
B. Shell of medium size ; both valves convex ; ears unequal ..	CHLAMYS.
C. Shell small, thin, translucent, with predominant concentric sculpture..	PSEUDAMUSIUM.

Subgen. 1. PECTEN, s. str.

Right valve moderately inflated, left valve flattish ; sculpture of strong ribs with radial striation, more or less roughened by simple concentric lamellation or incremental sculpture ; ears subequal.

Sect. 1. EUVOLA, Dall, 1898.

Euvola, Dall, Trans. Wagner Free Inst., iii, pt. 4, 1898, 694. Type : *Pecten ziczac*, L.

Right valve extremely inflated, surface polished, ribs moderate or obsolete, without radial striation, concentric sculpture inconspicuous ; left valve with or without conspicuous radial and concentric sculpture, flat or concave.

1. Pecten medius, Lamarck, 1819. Plate 56, figs. 7, *a*.

Pecten medius, Lamarck, A.s.V., vi, 1819, 163; Thes. Conch., i, pl. 15, f. 102–4; Conch. Icon., viii, pl. 11, f. 44; Hanley, Cat. Rec. Biv. Shells, 269; Hedley, Mem. A.M., iv, pt. 5, 303; Pritchard and Gatliff, P.R.S. Vic., xvii (n.s.), 261. *P. laticostatus*, Gray, Yate N.Z., 1835, 310. *Vola laticostatus*, Gray, M.N.Z.M., 171; not of Lamarck, 1819. *Pecten fuscus*, Sowerby, Thes. Conch., i, 47, pl. 16, f. 118, 119. *P. fumatus*, Reeve, Conch. Icon., viii, 1852, pl. 7, f. 32. *P.* (*Janira*) *fumatus*, Reeve, Chall. Rep., xiii, 307. *P. fumatus albus*, Tate, P.R.S. Tas., 1887, 113. *P. novæ-zelandiæ*, Reeve, *t.c.*, pl. 8, f. 36. *P. filosus*, Reeve, *t.c.*, pl. 11, f. 42. *P. meridionalis*, Tate, P.R.S. Tas., 1887, 114. *P. medius*, Lamarck: Dall and Simpson, Moll. Porto Rico, 1901, 465; Index, 93.

Shell nearly orbicular, rather solid, with subequal ears, prominently radially ribbed, attaining a large size. *Beak* of left (flat) valve minute, that of the right (convex) valve median, incurved, convex. *Ears* large, triangular, the anterior slightly larger. Dorsal margins short, straight, sloping gently toward the anterior and posterior rounded margins. *Sculpture:* Ears with faint radial ribs above and numerous incremental lines and ridges; right valve with wide rounded or flattened ribs, numbering usually 16, which are sometimes broken up into smaller ridges, crossed by very fine growth-lines; left valve with strong radial shoulders and narrow well-developed rounded ribs, the interstices much broader than the ribs, with very dense somewhat lamellar growth-lines; the reversed radial sculpture well pronounced on the inner side of the valves, the ribs being somewhat double near the margins. *Colour* of right valve purplish or whitish, sometimes faintly marbled or with concentric rows of brown spots; left valve red or purplish, sometimes variegated with small lighter blotches, generally having a lighter well-marked area at the beak. *Interior* white; sometimes the ears and the margins chestnut-brown. *Margins* thin, sharp, undulating, that of the right valve extending beyond the margin of the left valve. *Hinge* with 1 or 2 oblique lamellæ radiating from the apex (cardinal crura), and a faint lamella at the base of the auricles (auricular crura), usually ending in a tubercle. *Resilium* fairly strong, fixed in triangular pits underneath the beaks. *Adductor-scar* large, round, somewhat posterior. *Pallial line* simple.

Diameter—Ant.-post., 110 mm.; dorso-ventral, 92 mm.: thickness, 30 mm.

Type in the Mus. Hist. Nat., Geneva.

Hab.—North and South Islands of New Zealand, but more common in the North. Chatham Islands. Also Tasmania, Australia, and West Indies.

This free-swimming shell is found on sand-banks at and below low-water mark.

Fossil in the Pliocene.

Subgen. 2. Chlamys, Bolten, 1798.

Chlamys, Bolten, Mus. Bolten. (2), 1798, 161. Type: *Ostrea pallium*, L.
Myochlamys, von Ihering, 1907.

Valves moderately inflated, subequal, in general similar (except in colour); sculpture of radial ribbing with or without divaricating striation, with or without an imbricate surface layer; frequently spinose at the ridges; ears often discrepant, the posterior smaller.

Distribution.—World-wide.

Fossil.—Devonian to Tertiary.

Sect. 1. Chlamys, s. str.

Type: *Ostrea pallium*, L.

Ribs small and numerous, imbricate or spinose; valves subequal, similar, oblique, or with unequal ears, the posterior smaller; divaricate striation and imbricate surface layer usually present; shell generally solid and opaque; byssal notch and ctenolium (set of spines, resembling a short comb with curved teeth, on anterior margin of right valve at the byssal sinus) present.

Key to Species.

A. Number of ribs equal on both valves.
  a. 16–20 rounded ribs .. .. *dichrous.*
  b. About 40 unequal scaly ribs .. .. .. *zelandiæ.*
  c. About 80 subequal fine ribs .. .. .. *radiatus.*
B. Left valve with 11, right valve with 10 ribs, the latter unequal .. .. *imparvicostatus.*

2. Pecten dichrous, Suter, 1909. Plate 52, fig. 1.

P. (*Chlamys*) *dichrous*, Suter, P. Mal. S., viii, 1909, 264, pl. 11, f. 31.

Shell triangularly orbicular, moderately inflated, subequilateral, somewhat inequivalve, with rather distant rounded radial ribs, valves differently coloured. *Ears* very unequal, the anterior large, the posterior very small. *Beaks* approximate, the prodissoconch small, oval, smooth. *Anterior* and *posterior ends* similar, slightly concave above, then forming a half-circle with the basal margin. *Right valve* slightly more convex than the left, with a rather large triangular anterior ear with 4 radial costæ crossed by strong and close imbricating growth-lines, a distinct byssal sinus below, and a row of teeth below it on the anterior margin (ctenolium); the posterior ear very small, triangular, with a few concentric riblets. *Left valve* with the anterior ear also triangular, the anterior side straight or lightly sinuous, with about 6 scaly radiate riblets, the intercostal spaces with 1 or 2 fine scaly lines. *Sculpture* consisting of subequidistant rounded radial ribs, indenting the margins, the number varying from 16 to 20 on each valve; they are broadly or acutely rounded, sometimes ornamented with scales, more prominent on the left valve; towards the margins the ribs have very often 1 or several grooves, and in the interstices

1 to 3 radial fine riblets may be present; besides this sculpture there are minute divaricating radial lines (the so-called *Camptonectes* striation). The concentric sculpture consists of very fine and rather close undulating and slightly imbricating layers. *Colour* of right valve whitish, lightly tinged with pink, rarely yellowish-brown all over; left valve always much darker coloured, white with red concentric spots and bands, or reddish or yellowish-brown, sometimes mottled with white. *Inside* shining, white or stained with red, strongly grooved, the margins dentate or crenulate. *Hinge-line* straight, with distinct cardinal crura. *Resilifer* triangular, not very deep, its margins rather sharply raised; external *ligament* narrow and long.

Diameter—Ant.-post., 32 mm.; dorso-ventral, 36 mm.: thickness, 10 mm.

Type in my collection.

Hab.—A number of valves were found in the stomach of a blue-cod (*Parapercis colias*, Forster) caught in Port Pegasus, Stewart Island, and kindly given to me by Captain Bollons. East of Jones Head, in 20 fathoms; 19½ miles south of Oamaru, in 40 fathoms; off Lyttelton, in 100 fathoms (E. R. Waite).

Remarks.—This species is allied to the Miocene *Pecten chathamensis*, Hutton (C. Tert. M., 29), but this species has the ribs more scaly, the scales more distant; the ribs show no tendency to division towards the margins. The anterior ear of the right valve is not large, has no byssal sinus, and there is, of course, no ctenolium. The form and size of the shell and the number of ribs are about the same as in the Recent species.

3. Pecten imparvicostatus, Bavay, 1905. Plate 58, figs. 9, *a*.

Pecten imparvicostatus, Bavay, J. de Conch., liii, 1905, 23, pl. 2, f. 6, 7; Suter, T.N.Z.I., xxxviii, 317; not *P. australis*, Hutton, J. de Conch., xxvi, 54, nor *P. asperrimus*, Hutton, P.L.S. N.S.W., ix, 531, both being no doubt *P. gemmulatus*, Reeve.

Shell of medium size, rather solid, moderately convex, inequivalve, subequilateral. *Beaks* approximate, the prodissoconchs minute, triangular, smooth. *Ears* very unequal, the margins denticulate; anterior ears high and large, that on the right valve with a byssal sinus; posterior ears short and small. *Left valve* more convex than the right, which has a ctenolium at the byssal notch. *Discs* highly triangular, the anterior and posterior sides descending straight toward the regularly rounded basal margin. *Sculpture:* Anterior ear of left valve with 6 to 10 unequal squamose radial riblets, that of the right valve divided into an upper area with about 7 squamose radial costæ, and a lower byssal area with transverse lamellæ; posterior ears with 5 to 7 squamose riblets; left valve with 11 elevated subequal ribs, alternately stronger and more feeble, the insterstices broader than the ribs, with a median more slender rib, and the secondary

interspaces with a still much finer riblet, all being distantly squamose; right valve with 10 ribs, which are unequal, flattened, grooved and formed by the union of squamose riblets, the interspaces much narrower than the ribs. *Colour* of the left valve purplish-brown, and reddish-brown on the principal ribs; on the right valve the ribs are whitish or yellowish-red, the interstices darker. *Interior* polished, white, rayed with brown or purple. *Margins* denticulate. *Hinge* with distinct cardinal and anterior auricular crura. *Resilifer* narrowly triangular; external *ligament* narrow, extending the whole length of the hinge.

Diameter—Ant.-post., 18 mm.; dorso-ventral, 19 mm.: thickness, 7 mm.

Type in the British Museum.

Hab.—New Zealand; collected by Dr. Gall, of H.M.S. "Acheron" (type): Cape Maria van Diemen; Hauraki Gulf; Nelson; Bay of Islands; Chatham Islands: on rocks near low-water mark.

Remarks.—This species is more or less closely related to *P. bifrons*, Lamarck; *P. lividus*, Lamarck; and *P. aktinos*, Petterd.

4. **Pecten radiatus**, Hutton, 1873. Plate 56, fig. 9.

Pecten radiatus, Hutton, C.M.M., 82; J. de Conch., xxvi, 55; M.N.Z.M., 171; P.L.S. N.S.W., ix, 532; Index, 93; Hedley, P.L.S. N.S.W., xxxiii, 1908, 472, pl. 10, f. 28; Bavay, Bull. Mus. Hist. Nat., Paris. 1909, pt. 5. 277–80, pl. 4.

Shell of medium size, orbicular, compressed, equivalve, the ears very unequal, thin, finely radially ribbed. *Beaks* small, sharply pointed, approximate. Anterior *ears* large, triangular, that of the right valve with a small rounded byssal sinus; posterior ears much smaller, higher, narrowly triangular. *Discs* with the dorsal margins descending, slightly concave, the anterior, posterior, and basal margins regularly rounded; right valve with a ctenolium. *Sculpture:* The right anterior ear with the upper area radially ribbed, ribs about 7, crossed by imbricating lamellæ which extend over the byssal area; the right and left posterior ears with about 10 subequal oblique radial riblets, crossed by sharp upright vertical lamellæ; the left anterior ear with about 10 scabrous radial riblets; discs with numerous fine radial ribs, about 20 to 24 near the beaks, increasing to about 80 at the margin; these ribs are either subequal and equidistant, or they are grouped into about 24 ribs, each consisting of a stronger median rib which extends to the umbones, and 2 to 4 smaller, shorter riblets in the interspaces; distinct *Camptonectes* striation is present; there are dense fine and wavy concentric growth-lines, produced into fine scales on the lower half of the riblets. *Colour* very variable—red, lemon-colour, ochraceous, reddish, or brownish-purple. *Interior* shining, radially grooved, of the same colour as the outside. *Margins* thin and sharp, denticulate. *Hinge* with distinct cardinal and auricular crura. *Resilifer* triangular; the external small *ligament* extending the whole length of the hinge-line. *Adductor-scar* large, roundish, posterior. *Pallial line* simple.

Diameter—Ant.-post., 44 mm. ; dorso ventral, 46 mm. : thickness, 13 mm.

Type in the Dominion Museum, Wellington.

Hab.—Stewart Island. in 13 fathoms (type) ; near Cuvier Island, in 38 fathoms (Captain Bollons) ; off Waipapa Point, in 25 fathoms (E. R. Waite) ; Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons) ; Preservation Inlet ; Banks Peninsula.

Fossil in the Miocene and Pliocene.

5. Pecten zelandiæ, Gray, 1843. Plate 58, fig. 10.

Pecten zelandiæ, Gray, Dieff. N.Z., 260 ; Ereb. & Ter., 7, pl. 3, f. 7 ; C.M.M., 81 ; Crit. List, 50 ; M.N.Z.M., 170 ; Hutton, P.L.S. N.S.W., ix, 531. *P. latus*, Gould, P. Bost. S.N.H., iii, 1850, 345 ; U.S. Expl. Exp., xii, 456, atlas f. 571. *P. Dieffenbachi*, Reeve, Conch. Icon., viii, 1852, f. 88. *P. multicostatus*, Reeve, *t.c.*, f. 173 ; M.N.Z.M., 171.

Shell of medium size, rather thin, nearly equivalve, the ears very unequal, ventricose, colour very variable, with numerous unequal radiate squamose ribs. *Beaks* approximate, the protoconchs small, triangular, sharply pointed, smooth. Anterior *ears* large, triangular, the right with a deep quadrilateral byssal fissure ; posterior ears much smaller, triangular. *Discs* sharply angled above, separated from the auricles by a strongly marked shoulder, regularly rounded below. *Sculpture :* Ears with radial riblets crossed by concentric lamellæ, squamose ; the byssal area on the right anterior valve concentrically lamellate, and a ctenolium on the margin of the valve ; discs with numerous (about 40) unequal and inequidistant squamose ribs, the interstices narrow, with fine incremental striæ. *Colour* very variable—rosaceous, light brown, purple, red, light to orange yellow, occasionally with 3 or 4 paler rays. *Interior* white, or tinted with the same colour as the outside, shining. *Margins* thin and sharp, lightly crenate. *Hinge* smooth, a tubercle at the lower end of the anterior ears. *Resilifer* obliquely triangular ; *external ligament* narrow and extending the whole length of the hinge-line. *Adductor-scar* roundish, superficial, slightly posterior. *Pallial line* simple.

Diameter—Ant.-post., 31 mm. ; dorso-ventral, 33 mm. : thickness, 13 mm.

Type in the British Museum.

Hab.—Throughout New Zealand. Chatham Islands. Under rocks and on roots of seaweeds, from low-water mark to about 25 fathoms.

Fossil in the Miocene and Pliocene.

Subsp. gemmulatus, Reeve, 1852. Plate 56, fig. 10.

Pecten gemmulatus, Reeve, Conch. Icon., viii, 1852, f. 111 ; C.M.M., 81 ; Crit. List, 50 ; M.N.Z.M., 170. *P. neozelanica*, var. *gemmulatus*, Reeve : Hutton, P.L.S. N.S.W., ix, 531. *P. australis*, Sowerby : Hutton, J. de Conch., xxvi, 54 ; M.N.Z.M., 171 ; not of Sowerby. *P. asperrimus*, Lamarck : Hutton, P.L.S. N.S.W., ix, 531 ; not of Lamarck.

Distinguished from the species by the much more unequal radiate ribs : there are 12 to 20 prominent strong rounded and scaly ribs,

the interstices with none or 1 to 3 much finer ribs; there is a very great variability in the arrangement of the ribs, and occasionally it is similar to that of *P. asperrimus;* on the other hand, specimens occur which show only the strong prominent ribs, the interstices without or only an occasional finer riblet. Otherwise this subspecies does not differ from the species.

Type in the British Museum.

Hab.—South Island: Nelson; off Jones Head, in 20 fathoms; south of Oamaru, in 40 fathoms (E. R. Waite). Stewart Island (C. Traill). Chatham Islands.

Sect. 2. Pallium, Schumacher, 1817.

Pallium, Schumacher, Essai Nouv. Syst., 1817. Type: *Pecten plica*, Lam.

Shell with the disc high and narrow above, ears small; valves moderately inflated, nearly similar, the basal margin in the adult contracted, so that the edges meet each other nearly vertically; ribs few, large, widening distally, entire; surface radiately imbricately striate, frequently with *Camptonectes* striation, and imbricate external layer; the cardinal crura usually well developed, often irregular.

6. Pecten convexus, Quoy and Gaimard, 1835. Plate 56, figs. 8, *a*.

Pecten convexus, Q. & G., Voy. Astrol., iii, 1835, 443, pl. 76, f. 1–3; Hutton, J. de Conch., xxvi, 55; P.L.S. N.S.W., ix, 532; Index, 93. *P. roseopunctatus*, Reeve, Conch. Icon., viii, 1852, f. 84. *P.* (*Dentipecten*) *vellicatus*, Hutton, C.M.M., 82; M.N.Z.M., 171.

Shell slightly inequivalve, the right valve generally more inflated, the anterior ears somewhat larger, rounded, solid, with 4 to 5 broadly convex radiate ribs and very numerous finer ones, white spotted with pink, or reddish to purplish. *Beaks* minute, approximate, the prodissoconch smooth and sharply pointed. *Ears* unequal, the anterior ones larger: they are radially strongly ribbed, and the ribs crossed by numerous fine concentric striæ, some of which are squamose; right anterior auricle with very narrow byssal fissure, the opposite margin of the disc with a ctenolium. *Discs* triangular above, distinctly shouldered at the ears, rounded below, anterior end narrowly convex, posterior end a little more produced than the anterior, angularly rounded. *Sculpture* of discs consisting of 4 or 5 broad rounded radiate ribs and numerous small unequal and inequidistant radiate ribs, crossed by fine wavy concentric growth-lamellæ. *Colour* white spotted with pink or flesh-red, the right valve always of a paler colour than the left, sometimes reddish, purplish, or white with the large ribs only pink-coloured. *Interior* pinkish or white, shining, deeply grooved. *Margins* undulating, finely crenulate. *Hinge-plate* moderately broad, with rather indistinct cardinal crura. *Resilifer* small, triangular; *external ligament* narrow, extending the whole length of the hinge-line. *Adductor-scar* hardly impressed, irregularly rounded, subcentral, nearer the posterior end. *Pallial line* simple.

Diameter—Ant.-post., 46 mm. ; dorso-ventral, 43 mm. : thickness, 20 mm.

Type in the Mus. Hist. Nat., Paris.

Hab.—North and South Islands of New Zealand : Bay of Islands ; Hauraki Gulf, in 25 fathoms ; near Cuvier Island, in 38 fathoms ; Cook Strait ; Dusky Sound. Stewart Island.

Remarks—Although provided with a byssus, this mollusc has been observed swimming about. (Captain Bollons.)

The species is not common at all, and good specimens are only obtained by dredging. During the voyage of the "Astrolabe" only two empty shells were collected.

Fossil in the Miocene and Pliocene.

Subgen. 3. Pseudamusium, H. and A. Adams, 1858.

Pseudamusium, H. and A. Adams (after Klein), Ad. G.R.M., ii, 1858, 553. Type : *P. hybridus*, Gmel.

Shell small, thin, more or less translucent ; the sculpture, if any, feeble ; inner face of the disc without liræ ; disc with or without *Camptonectes* striation, frequently with concentric imbrication.

Sect. 1. Cyclopecten, Verrill, 1897.

Cyclopecten, Verrill, Trans. Conn. Acad., x, 1897, 70. Type : *C. pustulosus*, Verrill.

Sculpture discrepant on the two valves, the right valve having the concentric and the left valve the radial elements most pronounced ; valves usually flattish or compressed ; whitish, thin, with delicate sculpture.

From shallow to deep water.

Key to Species.

A. Left valve with 7–8 radiating liræ, crossed by concentric lamellæ *aviculoides.*
B. Left valve with numerous radial riblets, crossed by concentric threads, the points of intersection tuberculate .. *transenna.*

7. Pecten aviculoides, E. A. Smith, 1885. Plate 52, figs. 2, *a*.

Pecten aviculoides, E. A. Smith, Chall. Rep., xiii, 1885, 305, pl. 22, f. 5, 5*a*.
Cyclopecten aviculoides, Smith : Hedley, Rec. A.M., v, pt. 2, 87.

Shell small, very inequivalve, slightly oblique, thin, dirty-white. The *right valve* is very slightly convex at the centre, and fits, as it were, within the other valve, its very thin margin being upcurved and appressed to the outer edge of the other valve. It is *sculptured* with a few lines of growth, and has under the microscope a minutely shagreened appearance. The *left valve* is much deeper, and ornamented with coarse concentric lamellæ, which, crossing about 7 or 8 strongish radiating liræ, produce a coarsely cancellated surface. The *ears* in this valve have only the concentric lamellæ, and are about equal in size, the posterior being sinuated at the side. The *anterior auricle* in

the right valve is ornamented with concentric lamellæ of growth which cross a few radiating ridges, and it is rather deeply cut in beneath. The *hinge-line* occupies the whole length of the shell, and above the centre the umbo of the left valve is slightly prominent.

Length, 2 mm.; height, 1·75 mm.; diameter, 0·5 mm. (E. A. Smith).

Type in the British Museum.

Hab.—Foveaux Strait, one specimen (A. Hamilton). The type is from Prince Edward Island, in 100 to 150 fathoms.

8. Pecten transenna, n. sp. Plate 52, fig. 3.

Left valve minute, somewhat oblique, roundly ovate, with straight dorsum and subequal ears, translucent, white, very thin and fragile, moderately convex, with numerous radial riblets and concentric threads. *Beak* slightly anterior, a little raised, rounded, and smooth. *Ears* subequal, small, not distinctly marked off from the disc. *Anterior end* a little shorter, convex, receding below, slightly sinuated below the ear; *posterior end* straight above and rapidly descending, produced and convex below; the ventral margin broadly convex. *Sculpture* consisting of numerous fine radiate riblets, with a few secondary shorter riblets, crossed by subequidistant fine concentric lines, the points of intersection with small tubercles. *Colour* white. *Interior* white, shining, smooth. *Hinge-line* straight, with a small triangular resilium beneath the umbo.

Diameter—Ant.-post., 3·4 mm.; dorso-ventral, 3 mm.: thickness, 1 mm.

Right valve not seen.

Type in my collection.

Hab.—Near the Snares, in 50 fathoms (type); near the Bounty Islands, in 50 fathoms (Captain Bollons).

Order 3. EULAMELLIBRANCHIA.

Pelecypoda in which the edges of the mantle are generally united by one or two sutures. Two adductor muscles are usually present. In the gills the branchial filaments are united at regular intervals by vascular junctions, which transform the linear interfilamentar spaces into a series of fenestræ. Similarly the lamellæ of each gill-plate have vascular junctions which form afferent vessels in the interior of the plates. The gonads always have their own proper external orifices.

Suborder 1. OSTRACEA.

Monomyarian *Eulamellibranchia*, or with a very small anterior adductor muscle. The mantle is open, without siphons; the foot rather small or absent, generally no byssus; the branchiæ folded.

Shell degenerate, sessile, inequivalve, generally edentulous, wings obsolete; with a subnacreous or porcellanous inner and prismatic outer layer; epidermis inconspicuous; area amphidetic, ligament alivincular.

Fam. LIMIDÆ, d'Orbigny.

Animal with a digitiform foot with a byssogenous apparatus. Borders of the mantle provided with long and numerous tentacles. Gills not united with the mantle, with direct and reflected limbs.

Shell equivalve or subequivalve, auriculate, gaping, free or fixed by a byssus; beaks pointed, straight, distant, showing part of the area and of the ligamental fossette between them; hinge edentulous, or with traces of denticles on each side of the resilifer; area amphidetic, equal in both valves; ligament alivincular, resilium subinternal.

Carboniferous to Recent.

Genus 1. LIMA (Bruguière), Cuvier, 1798.

Lima, Bruguière, Enc. Méth., 1792, pl. 206; Cuvier, Tabl. Elém., 1798, 421. Type: *Ostrea lima*, L. *Mantellum*, Bolten, Mus. Bolten., 1798, 160. *Limaria*, Link, Beschr. Rostock Samml., 157. *Glaucion*, Oken, Zool., 1815. *Radula*, H. and A. Adams, Ad. G.R.M., ii, 1858, 556; not of Gray, 1844. *Ctenoides*, H. and A. Adams, *t.c.*, 557. *Acesta*, H. and A. Adams, *t.c.*, 558.

Animal with the outer border of the mantle beset with rows of unequal long tentacles; duplication of the inner border of the mantle free floating, the ocelli not easily visible; foot digitiform, canaliculate; byssus more or less developed; lips ornamented with arborescent outgrowths; labial palps small, striated on the inner side; rectum floating at the posterior end of the adductor of the valves.

Shell equivalve, compressed, white, obliquely oval, having rayed ribs or striæ, auriculate; anterior side generally straight, gaping; posterior side rounded, usually closed; hinge area triangular, with a central resilium; muscular impressions lateral, duplex, large.

Distribution.—All seas.

Fossil in the Secondary and Tertiary, the maximum in the Cretaceous.

Vernacular Name.—File-shell.

Remarks.—The *Limæ* appeared in very ancient epochs, and during the Oolitic period species were comparatively abundant and attained great dimensions. About thirty well-marked forms inhabit existing seas, living in various depths of water, either free, or moored by a byssus, or enveloped in nests formed of byssal filaments.

The animals are very beautiful and curious, and often much larger than their shells, which in the greater number of species, though remarkable for elegance of outline and sculpture, rarely present any other colour than a milky-white. The majority of known living species come from the South Seas and Indian Ocean.

KEY TO SUBGENERA.

A. Valves gaping, inequilateral .. .. LIMA, s. str.
B. Valves closed, equilateral .. .. LIMATULA.

Subgen. 1. LIMA, s. str.

Hinge edentulous; valves usually gaping, inequilateral.

Sect. 1. LIMA, s. str.

Sculpture radial, submargins impressed. Type: *L. lima*, L.

KEY TO SPECIES.

A. Shell attaining a moderately large size, solid, ribs stout, valves gaping .. .. *lima.*
B. Shell small, thin, riblets numerous and very fine, valves closed *sydneyensis.*

1. Lima lima, Linné, 1758. Plate 58, fig. 11.

Ostrea lima, Linné, Syst. Nat., ed. 10, 1758, 699. *Lima lima*, L.: Lamarck, Mém. Soc. H.N., Paris, 1799, 88. *L. squamosa*, Lamarck, A.s.V., vi, 1819, 156; Thes. Conch., i, 84, pl. 21, f. 1, 18; Hanley, Cat. Rec. Biv. Shells, 266; Conch. Icon., xviii, 1872, pl. 2, f. 10; C.M.M., 83; Hutton, J. de Conch., xxvi, 55; Chall. Rep., xiii, 287. *L. zealandica*, Sowerby, P.Z.S., 1876, 754, pl. 75, f. 1; M.N.Z.M., 172; Hutton, P.L.S. N.S.W., ix, 531.

Shell solid, inequilateral, rather inflated, radiately ribbed, slightly gaping on each side. *Beaks* elevated, distant, incurved, sharply pointed, the small prodissoconch smooth. *Anterior end* obliquely produced, straight; *posterior end* obliquely rounded, with small oblique triangular ears; basal margin regularly convex, forming an obtuse angle with the anterior margin. Submargin large, oblong, concave, with radiate riblets and concentric striæ. *Sculpture:* Ears with a few concentric ridges produced above into triangular scales; discs with 18 strong radiating ribs, which are covered with large rough elevated scales. *Colour* whitish, the ribs sometimes reddish-brown. *Interior* white, polished, the ribs distinctly visible. *Margins* strongly dentate. *Hinge-line* moderately broad, smooth, with a tubercle on each end. *Resilium* triangular, central, with a triangular area reaching to the beak above it on each side; in front and behind a narrow triangular ligament, which is wholly external. *Adductor-scar* large, double, slightly posterior. *Pallial line* simple.

Diameter—Ant.-post., 42 mm.; dorso-ventral, 49 mm.: thickness, 28 mm.

Type of *L. squamosa*, Lam., in the Mus. Hist. Nat., Geneva; of *L. zealandica*, Sow., in the British Museum.

Hab.—Dusky Sound, in 30 fathoms; Preservation Inlet; Stewart Island; Foveaux Strait; near the Snares, in 50 fathoms (Captain Bollons); south of Oamaru, in 40 fathoms (E. R. Waite).

This species has a wide range of distribution. The type is from the Mediterranean, and it also occurs at Madeira, Tenerife, from Florida to Brazil, Red Sea, Ceylon, Philippine Islands, Darnley Island, Louisiade Archipelago. In the Carribean Sea it has been dredged in 640 fathoms.

Fossil in the Pliocene.

Subsp. **multicostata**, Sowerby, 1843. Plate 58, fig. 12.

Lima multicostata, Sowerby, Thes. Conch., i, 1843, 85, pl. 22, f. 38; Conch. Icon., xviii, pl. 1, f. 4; Chall. Rep., xiii, 288; Pritchard and Gatliff, P.R.S. Vic., xvii (n.s.), 259. *Radula lima*, Angas, P.Z.S., 1865, 656. *Lima caribæa*, d'Orbigny, Sagra's Hist. Cuba, Moll., ii, 337; atlas, pl. 28, f. 17–19.

This subspecies is distinguished from *L. lima* by the higher, narrower, and thinner shell, and it has many more and finer ribs, their number being about 30 to 35 on the disc, and the prickles on them are more delicate.

Diameter—Ant.-post., 36 mm.; dorso-ventral, 48 mm.: thickness, 20 mm.

Type in the British Museum.

Hab.—Bay of Islands. The type is very likely also from the Mediterranean. The "Challenger" Expedition obtained the species off Bermuda, in 1,075 fathoms; off Tongatabu, in 18 fathoms; and in Port Jackson, in 2 to 18 fathoms. Tasmania and Australia.

2. **Lima sydneyensis**, Hedley, 1904. Plate 52, figs. 4, *a*, *b*.

Lima brunnea, Hedley, P.L.S. N.S.W., 1901, 21, pl. 2, f. 7–9; not of Cooke, 1886. *L. sydneyensis*, Hedley, *l.c.*, 1904, 200; Suter, T.N.Z.I., xxxix, 270.

Shell thin, translucent, small, shaped like an axe-head, with no gape, very inequilateral. *Anteriorly* the shell is truncate for almost the whole height, the truncated portion being sharply and deeply infolded. A curve of half a circle is described by the ventral and posterior margins. *Cardinal area* triangular, overhung by the incurved beaks, and sharply defined by a ridge above. *Sculpture:* The whole surface is evenly covered by fine close radiating riblets, which are microscopically beaded, diverge from a median parting, and are occasionally disjointed by concentric growth-lines. *Colour* pale brown. *Interior* polished, faintly tinged with purple. *Margins* denticulated by the radiating riblets. *Hinge-line* short; auricles almost obsolete. *Cartilage* narrow, in an obliquely descending shallow sulcus, which barely undulates the hinge-margin.

Diameter—Ant.-post., 6 mm.; dorso-ventral, 8 mm.: thickness, 4 mm.

Type in the Australian Museum, Sydney.

Hab.—Whangaroa Harbour (C. Traill). The type is from Port Jackson, New South Wales.

Sect. 2. MANTELLUM, H. and A. Adams, 1858.

Mantellum (Bolten), Ad. G.R.M., ii, 558. Type: *L. hians*, Gmel.

Shell thin, ventricose, oblique; anterior side of shell widely gaping; submargins not impressed. Hinge-margin oblique; cartilage-pit central, projecting into the cavity of the shell.

3. Lima angulata, Sowerby, 1843. Plate 63, fig. 4.

Lima angulata, Sowerby, P.Z.S., 1843, 23; Thes. Conch., i, 1843, 86, pl. 22, f. 39, 40; Chall. Rep., xiii, 289; Tate, P.R.S. S.Aust., ix, 109; Hedley, Mem. A.M., iv, 310; Hutton, J. de Conch., xxvi, 55; M.N.Z.M., 172; P.L.S. N.S.W., ix, 531; Conch. Icon., viii, pl. 3, f. 13; Gatliff, P.R.S. Vic., xx (n.s.), 37; Verco, T.R.S. S.Aust., xxxi, 314. *L. basilanica*, Adams and Reeve, Voy. "Samarang," 75, pl. 21, f. 6. *L. orientalis*, Ad. & Rve., *op. cit.*, 75, pl. 21, f. 7.

Shell small, thin, transparent, oblique, ventricose, white, finely radially costate. *Beaks* distant, sharply pointed, incurved. *Ears* small, the anterior somewhat larger, triangular. *Anterior end* obliquely descending, straight; *posterior end* prominently convex at the middle; basal margin regularly rounded. *Cardinal area* narrow. *Sculpture* consisting of fine inequidistant radiate riblets, the interstices usually slightly broader than the costæ, crossed by fine and dense concentric growth-lines. *Colour* white. *Interior* polished, showing the radiate sculpture. *Margins* finely dentated, but smooth anteriorly. *Hinge-line* rather short, the greater part of it occupied by the broadly triangular cartilage. *Adductor-scar* indistinct.

Diameter—Ant.-post., 11 mm.; dorso-ventral, 14 mm.: thickness, 7 mm.

Type in the British Museum.

Hab.—Off Lyttelton, in 100 fathoms; south-east of Cape Saunders, in 100 fathoms; twenty-four miles south-east of Long Point, in 120 fathoms (E. R. Waite); Snares, in 50 fathoms (Captain Bollons); ten miles north of Enderby Island, in 85 fathoms (E. R. Waite). Also Australia, Philippine Islands, New Caledonia, Panama, Acapulco, Mexico, Juan Fernandez Island. The type is from Panama and Bay of Caracas.

Fossil in the Pliocene.

Subgen. 2. LIMATULA, Searles Wood, 1839.

Limatula, S. Wood, A.M.N.H., iii, 1839, 260. Type: *L. subauriculata*, Montagu.

Valves closed, equilateral, more or less distinctly mesially sulcate: sculpture radial.

KEY TO SPECIES.

A. Valves with a well-defined median sulcus .. .. .. *Suteri.*
B. Valves without a median sulcus, regularly radiately ribbed .. *bullata.*

4. Lima bullata, Born, 1780. Plate 58, fig. 13.

Ostrea bullata, Born, Mus. Cæs. Vindobon., 1780, 110, pl. 6, f. 8. *Lima bullata*, Born, Thes. Conch., i, 1843, 84, pl. 20, f. 32, 33; Conch. Icon., xviii, pl. i, f. 3; Tryon, Struct. & Syst. Conch., iii, 287, pl. 132, f. 93; C.M.M., 83; Crit. List, 49; Hutton, P.L.S. N.S.W., ix, 531; Chall. Rep., xiii, 292. Pritchard and Gatliff, P.R.S. Vic., xvii (n.s.), 260; Verco, T.R.S. S.Aust., xxvi, 314. *Ostrea inflata*, Gmelin, Syst. Nat., ed. 13, 1790, 3321. *Lima Strangei*, Sowerby, Conch. Icon., xviii, pl. 3, f. 15. *L. japonica*, A. Adams: Hutton, J. de Conch., xxvi, 55; M.N.Z.M., 172; not of A. Adams.

Shell elongate, very slightly oblique, equivalve and subequilateral, fairly solid, radially costate, white. *Beaks* distant, pointed, incurved. *Ears* small, slightly produced, nearly equal in size. *Anterior* and *posterior ends* convex, subequal, the latter slightly more convex; basal margin narrowly convex. *Sculpture* consisting of numerous fine radiating costæ, which become obsolete at the sides, with fine concentric growth-lines. *Colour* white. *Interior* lightly shining, the radial sculpture more or less visible. *Margins* faintly crenate. *Hinge area* straight; the *cardinal area* transversely lamellate. *Resilifer* broadly triangular, not deep. *Adductor-scar* posterior, not large, rounded.

Diameter—Ant.-post., 17 mm.; dorso-ventral, 29 mm.: thickness, 18 mm.

Type in the K.K. Hofmuseum, Vienna.

Hab.—Cape Maria van Diemen; Bay of Islands; Hauraki Gulf; south of Oamaru, in 40 fathoms; twenty-four miles south-east of Cape Saunders, in 120 fathoms; 21½ miles north-east of Wreck Reef, in 50 fathoms (E. R. Waite); Stewart Island; Snares, in 50 fathoms (Captain Bollons); Chatham Islands; Kermadec Islands (Captain Bollons). Also Tasmania, Australia, and Philippine Islands.

Fossil.—Oligocene to Pliocene.

5. Lima Suteri, Dall, 1908. Plate 63, fig. 5.

Lima (Limatula) Suteri, Dall, Bull. Mus. Comp. Zoology, Harvard College, xliii, No. 6, Oct. 1908, 410.

Shell about the size and form of *L. subauriculata*. *Beaks* small, prominent. *Sculpture* consisting of fine concentric incremental lines and feeble radial riblets, discrepant on the two valves, slightly directed backward distally; both valves with a well-defined median sulcus, which on the interior of the valves is bordered on each side by a single distinct rib; right valve externally has 1 rib in front of the sulcus and 7 to 9 behind it; left valve with 7 or 8 ribs on each side of the sulcus; the ends of the ribs serrate the ventral margin. *Colour* white or pale-brownish. *Hinge-line* subequally divided, the auricular angles prominent; the amphidetic area narrow. *Resiliary pit* wide and short.

Diameter—Ant.-post., 4·5 mm.; dorso-ventral, 7·1 mm.: thickness, 3·5 mm. (W. H. Dall.)

Type in the U.S. Nat. Museum, Washington (No. 195290).

Hab.—Port Pegasus, Stewart Island, in 18 fathoms, type (Captain Bollons); Foveaux Strait, in 15 fathoms; Snares, in 50 fathoms (Captain Bollons).

Fam. **OSTREIDÆ**, Lamarck.

Animal marine, the foot much reduced and devoid of a byssus. Heart generally on the ventral side of the rectum. The gills fused to the mantle. Monomyarian, the anterior adductor absent, but dimyarian when young.

Shell more or less distorted by early adherence to other objects, fixed by the left and larger valve; beaks subcentral or curved; an internal ligament in a triangular resilifer; hinge area without teeth; the adductor-scar subcentral or posterior; pallial line indistinct; with a subnacreous or porcellanous inner and prismatic outer layer.

Genus 1. Ostrea, Linné, 1758.

Ostrea, L., Syst. Nat., ed. 10, 1758, 696. Type: *O. edulis*, L.

Animal shaped like the shell, its mantle freely open and without siphons, the edges double, and each bordered by short tentacular fringes; no conspicuous ocelli; branchial leaflets not doubled on themselves; labial appendages triangular, connected around the mouth by a plain membrane; foot obsolete; sexes distinct or united.

Shell irregular in shape, attached by the left valve, which is the larger and the more convex; right valve usually flat or concave, often smooth, and minus the radiating ridges which are usually so conspicuous on the other valve; lines or corrugations of growth prominent on both valves; ligamental area triangular or elongate, symmetrical; structure laminated, subnacreous; muscle-scars large, well pronounced, subcentral.

Distribution.—About 100 species are known from warm and temperate seas; the genus does not occur in cold seas.

Fossil in the Secondary and Tertiary, the majority in the Cretaceous.

Remarks.—The value and importance of the oysters as an article of food is well known to everybody, and the oysters of Venice, England, and the Dardanelles were much appreciated by the luxurious Greeks and Romans of an ancient date. Useful information may be found in: Philpot, "Oysters and all about them" (2 vols.); T. H. Huxley, "Oysters and the Oyster Question" (English Illustr. Mag., 1883–84, pp. 47–55, 112–21), and "Scientific Memoirs" (iv, 1902, pp. 572–605); Saville Kent, "Oysters at the Antipodes" (*Nature*, vol. xlv, pp. 43–45); M. F. Woodward, "Anatomy of the Larva of *Ostrea edulis*" (P. Mal. S., i, 297).

KEY TO SPECIES.

A. Margins of valves smooth inside.
  a. Shell ovato-orbicular, concentrically lamellate, left valve usually with short rounded ribs near the margin .. *Angasi.*
  b. Shell irregular in form, left valve with concentric lamellæ and radiating subtubular folds .. .. *hyotis.*
  c. Shell suborbicular, with straight dorsal margin, free part of lower valve erect in adult shells, with short rounded radiate ribs .. .. *Tatei.*
B. Margins of valves crenate within, usually only on the dorsal parts.
  a. Shell ovate, lower valve with numerous rounded radiate ribs, upper valve often with 3 broad purplish-black radiate rays .. .. *corrugata.*
  b. Left valve with about 6 stout bifurcating sharp ridges, margins deeply dentated .. .. *glomerata.*
  c. Valves laterally arched, crescentic, concentrically lamellate.. *reniformis.*

Sect. 1. OSTREA, s. str.

Margins of the valves smooth inside.

1. Ostrea Angasi, Sowerby, 1871. Plate 57, fig. 3.

Ostrea Angasi, Sowerby, Conch. Icon., xviii, pl. 13, f. 27 (erroneously numbered 28); Tate and May, P.L.S. N.S.W., xxvi, 441; Index, 93. *O. purpurea*, Hanley, Conch. Misc., 1854, pt. 3; Angas, P.Z.S., 1867, 934; Hutton, C.M.M., 84; J. de Conch., xxvi, 56; Index, 93. *O. lutaria*, Hutton, C.M.M., 84. *O. virginica*, Lamarck: Hutton, C.M.M., 84; not of Lamarck. *O. discoidea*, Gould: Hutton, J. de Conch., xxvi, 56, M.N.Z.M., 175; not of Gould. *O. edulis*, L.: Hutton, M.N.Z.M., 175; P.L.S. N.S.W., ix, 533; not of Linné. *O. edulis Angasi*, Sowerby: Hutton, *t.c.*, 533.

Shell ovato-orbicular, slightly attached by the left valve or free, greyish-brown or purple, both valves concentrically laminated, left valve usually with radiate short and rounded ribs near the margin. *Beaks* very often produced, sharply rounded. *Anterior* and *posterior end* more or less convex, the latter frequently produced. *Sculpture:* Left valve with concentric growth-lines, generally laminate, and short irregular rounded ribs toward the margin; right (flat) valve with laminated concentric scales, the radiate sculpture mostly obsolete. *Epidermis* thick, horny, produced at the margins. *Colour* greyish-brown to purple, the right valve often light brown and radially streaked with dark purple. *Interior* yellowish or greenish-white, faintly shining. *Margins* irregular, sharp, wavy, sometimes purple. *Hinge area* triangular, elevated. *Resilium* triangular, winged laterally, and extending over the whole of the hinge-line. *Adductor-scar* large, lunate, rounded in front, raised and narrowed behind, not very deeply impressed, situate behind the vertical median line, and very little below its centre. *Pallial line* indistinct.

Diameter—Ant.-post., 70 mm.; dorso-ventral, 84 mm.: thickness, 16 mm.

Type in the British Museum.

Hab.—North and South Islands of New Zealand, but more common in the south, where, in Foveaux Strait and near Stewart Island, extensive beds occur. Also Tasmania and Australia.

Remarks.—This is the southern analogue of the European *O. edulis*, L., under which name it has been more frequently quoted by conchological writers. The beds near Stewart Island are regularly exploited from February to September, and they are in an average depth of 15 fathoms.

Vernacular Name.—Mud-oyster: commonly known as Stewart Island oyster.

Maori.—Tio (*fide* Captain Bollons).

Fossil in the Miocene and Pliocene; Pleistocene in Australia.

2. Ostrea hyotis, Linné, 1758. Plate 57, fig. 2.

Mytilus hyotis, L., Syst. Nat., ed. 10, 1758, 704. *Ostrea hyotis*, L: Hanley, Cat. Rec. Biv. Shells, 308; Conch. Icon., xviii, pl. 4, f. 7; Tate, T.R.S. S.Aust., viii, 96, pl. 6, f. 5; C. Tert. M.B.M., 299.

Shell moderately large, of variable, irregular form, suborbicular, triangular to subquadrate, fairly solid, with numerous foliaceous scales, slightly attached by the left valve. *Beaks* much produced, broadly and flatly convex. *Anterior end* generally convex; *posterior end* straight or lightly convex, frequently with winged processes. *Sculpture:* Left valve with rather distant concentric lamellæ and numerous angular radiating folds with subtubular patulous spines, which very frequently are only semitubular or reduced to broad foliaceous scales; right valve flattish, concentrically lamellate, the radiate folds more or less obsolete. *Epidermis* thick, horny, rather brittle. *Colour:* Lower valve white, upper valve light to dark brown. *Interior* light greenish-yellow, white at the margins and near the umbones. *Margins* sharp, in young specimens the epidermis extending far beyond them. *Hinge-line* narrow. *Cardinal area* above high, triangular, somewhat concave. *Resilifer* triangular. *Adductor-scar* large, semicircular, subcentral, and slightly posterior.

Diameter—Ant.-post., 75 mm.; dorso-ventral, 90 mm.: thickness, 16 mm.

Hab.—Queen Charlotte Sound, in 16 fathoms (Captain Bollons).

Remarks.—This species is, in Queen Charlotte Sound, almost without exception attached by the umbo of the left valve to a *Turritella rosea*. The type is from the Indian seas.

Fossil in the Pliocene of Wanganui: it also occurs in the Eocene of South Australia and Victoria, the older Tertiary of Java, and in the Tertiary of India (as *O. tubifera*, Sow.).

3. Ostrea Tatei, n.n. Plate 57, fig. 4.

Ostrea hippopus, Tate, T.R.S. S.Aust., viii, 1886, 98, pl. 4, f. 1; not of Lamarck, 1819.

Shell suborbicular, inequivalve; hinge-line straight, umbo depressed, subcentral; lower valve with the lower half more or less

erect. *Beaks* inconspicuous, usually nearer the anterior end, but median in young specimens. *Anterior end* very slightly convex, descending; *posterior end* much more produced, irregularly rounded; dorsal margin almost straight; basal margin lightly convex, undulating. *Sculpture:* Left valve attached to rocks by about half its surface, the free part more or less erect, with numerous concentric lamellose plications, crossed by radiate short and rounded ribs; right valve nearly flat, undulose towards the margin, which is included within the lower valve, the surface irregularly concentrically lamellate. *Epidermis* thick, horny, brittle. *Colour* of left valve whitish, right valve brown. *Interior* olive, white at the anterior and posterior margins, but slightly shining. *Margins* smooth, sharp. *Hinge-line* straight, narrow. *Resilifer* low triangular, narrowly extended laterally. *Adductor-scar* large, semicircular, transverse, with its anterior part at the centre of the valve.

Length, 66 mm.; height, 60 mm.; depth of elevated front, 40 mm. (type).

Type in the South Australian Museum, Adelaide.

Hab.—Lyttelton; Te Onepoto, near Lyttelton (H. S.); Dunedin.

Remarks.—The type is from glauconitic limestone, Aldinga Bay, South Australia (Eocene). The shell, when attached to the rock, has sometimes very much the appearance of a *Chamostrea*. It is not recorded as Recent from Australia.

This is the Dunedin rock-oyster.

Fossil in the Miocene and Pliocene.

Sect. 2. Eostrea, von Ihering, 1907.

Eostrea, von Ihering, An. Mus. Nacional Buenos Aires, xiv, 1907, 42. Includes *O. puelchana* and *O. sprata*, d'Orb.

Margins of the valves crenate inside, frequently distinct only on the dorsal parts.

4. Ostrea corrugata, Hutton, 1873. Plate 57, fig. 5.

Ostrea corrugata, Hutton, C. Tert. M., 35; Hector, Outline Geol. N.Z., 51, f. 2; Hutton, Plioc. M., 90. *O. discoidea*, Gould: E. A. Smith, Ereb. & Ter., 7, pl. 2, f. 15; not of Gould.

Shell ovate, irregular, left valve usually attached to a small extent only, radiately ribbed, upper valve with imbricating concentric laminæ. *Beaks* rounded, but sometimes very much produced and curved. *Anterior* and *posterior ends* convex, with regular or irregular outlines. *Sculpture:* Left valve with numerous unequal rounded radiate ribs, crossed by distant concentric undulating and imbricating laminæ; right valve flattish, with concentric fine striæ, produced into imbricating and strongly undulating laminæ round the margin. *Epidermis* horny, rather thick. *Colour* of lower valve yellowish-white, upper valve light brown, sometimes with 3 broad purplish-black radiate rays.

Interior olive in the centre, whitish round the margins, porcellanous. *Margin* of lower valve crenate below; there are also minute crenellations on the dorsal posterior margin. *Hinge-line* arcuate, usually with a low posterior lamina in the left valve. *Resilium* in a broadly triangular pit, spreading narrowly on both sides of the pit. *Adductor-scars* large, ovate, subcentral.

Height, 76 mm.; length, 66 mm. (type).

Type, from the Pliocene, in the Dominion Museum, Wellington.

Hab.—Bay of Islands; Hauraki Gulf (H. S.); Manukau.

Fossil in the Miocene and Pliocene.

Remarks.—On *Haliotis* shells small oysters are sometimes found adhering with the whole surface of the left valve, which is, of course, smooth, but the right valve has the brown radiate rays, the dorsal margins are crenate within, and the adductor-scars correspond also perfectly with those of typical *O. corrugata*. The right valve is always more or less convex: the left flat, but little excavated.

5. Ostrea glomerata, Gould, 1850. Plate 57, fig. 6.

Ostrea glomerata, Gould, P. Bost. S.N.H., iii, 1850, 346. U.S. Expl. Exp., xii, 401, atlas f. 577; M.N.Z.M., 175. *O. mordax*, Gould: Hutton, C.M.M., 84; not of Gould.

Shell orbicular crescentic, turning to the left or to the right, left valve deeply concave, with a deep umbonal pit, sharp-ribbed, margin dentate or lobed, solid. *Beaks* usually much produced, curved, concave on the inner side. *Anterior end* convex; *posterior end* straight or concave. *Sculpture:* Left valve with about 6 stout sharp bifurcating ribs, the interstices deep and narrow, crossed by distant concentric laminæ; right valve opercular, compressed, wrinkled with thick concentric laminæ, with dentiform foliations near the margin. *Epidermis* horny, solid, extending on the margins beyond the inner nacreous portion. *Colour* slaty-black, with a few well-defined white radiations. *Interior* white, the margins and adductor-scars purple, upper valve usually blotched with purple. *Margins* deeply dentated and lobed; the upper valve is furnished with a few irregularly disposed granules near the hinge, with corresponding pits in the lower valve. *Hinge area* broad, furrowed. *Resilium* high and broad. *Adductor-scar* circular, excavated above, posterior and a little below the middle of the dorso-ventral line.

Dorso-ventral diameter, about 80 mm.

Type in the U.S. Nat. Museum, Washington.

Hab.—Northern part of the North Island; Hauraki Gulf; Bay of Islands, &c.

Remarks.—This is the highly esteemed Auckland rock-oyster, picked from May to end of September, and consumed in large quantities. Sometimes it is found attached to kelp-roots.

6. Ostrea reniformis, Sowerby, 1871. Plate 57, fig. 7.

Ostrea reniformis, Sowerby, Conch. Icon., xviii, 1871, pl. 24 f 57; Hutton, J. de Conch., xxvi, 56; M.N.Z.M., 175; P.L.S. N.S.W., ix, 533. Index, 93.

Shell thick, elongated, narrow, laterally arched, whitish, inequivalve; upper valve compressed, flattened, a little leafy towards the margins, edged within with purple; lower valve deeply excavated, ventral margin straight, muscular impressions blackish-purple. (Sowerby.)

Type in the British Museum.

Hab.—Unknown.

Remarks.—In my collection there are specimens which to some extent agree with Sowerby's diagnosis and figures; they cannot be assigned to any of the New Zealand species enumerated, and it seems to me, anyhow for the present, preferable to refer them to *O. reniformis*, although we cannot say where the type was found. In outline and form of the valves they correspond fairly well with the figures, but the margins are not edged with purple within, and the adductor-scars are not blackish-purple, but dark olive; both valves are olive-coloured on the inner side; the anterior and posterior dorsal margins of the right valve are distinctly crenate, but this character seems to be lost in old shells. The adductor-scars are semicircular, a little below the dorso-ventral middle and posterior. A good series of these oysters should be compared with the type. We know next to nothing of the influence of environment on individual specimens of the New Zealand species, but it seems highly probable that extended observations in this direction may lead to a reduction of species.

Hab.—Auckland Harbour (H. S.).

Fam. PINNIDÆ, Meek.

Animal dimyarian, with a very small anterior adductor muscle. Foot byssiferous.

Shell mytiliform, not winged, dimyarian, the anterior adductor-scar smaller; equivalve, truncate, and wholly open behind; edentulous; area linear; ligament parivincular, internal; shell-structure coarsely prismatic, with a thin partial nacreous lining.

Devonian to Recent.

Genus 1. Atrina, Gray, 1840.

Atrina, Gray, Synopsis Brit. Mus., 1840. Type: *Pinna nigra*, Chemn.

Animal having the foot conic, elongated, byssiferous; labial palps moderately large, elongated; the small anterior adductor of the valves under the beaks, the large posterior adductor subcentral; retractor of the byssus large, in front of the posterior adductor.

Shell equivalve, triangular, wedge-shaped, exceedingly inequilateral, with the beaks pointed, anterior, terminal; the apical portion entire, not fissured, the internal nacreous layer entire. Hinge straight, long, toothless. Ligament linear, internal. Pallial line entire.

Distribution.—Warm and temperate seas, from low-water mark to about 100 fathoms.

Fossil the genus appears first in the Carboniferous.

Remarks.—The animals live buried in mud or sand, with the sharp edges of the valves gaping and protruding from the surface. Pearls of an amber colour are sometimes found in the shells of *Pinna* and *Atrina*. Some species are used as food, and others are valued for their long and silky byssus, which, mixed with silk, has been woven into gloves and other articles.

Vernacular Name.—Fan-mussel.

1. Atrina zelandica, Gray, 1835. Plate 57, fig. 1.

Pinna zelandica, Gray, Yate N.Z., 310; Dieff. N.Z., 259; Conch. Icon., xi, f. 13; M.N.Z.M., 169. *P. senticosa*, Gould, P. Bost. S.N.H., iii, 1850, 312; U.S. Expl. Exp., xii, 448, atlas f. 574.

Shell large, wedge-shaped, rather firm, of a dusky colour, with longitudinal scaly ribs. *Beaks* terminal, approximate, sharply rounded. *Anterior end* pointed, the dorsal margin slightly ascending and convex to straight; the basal margin first horizontal, then descending slightly and straight to the *posterior end*, which is slightly oblique and obtusely rounded. *Sculpture* consisting of rather close obsolete longitudinal ribs, absent on the lower anterior part of the valves, armed with close short semicylindrical hollow spines, mostly lost on the anterior part of the valves; close lines of growth are prominent on the lower part, where the longitudinal ribs are wanting. *Epidermis* horny, thick, very brittle. *Colour* brown, inclined to purple. *Interior* light brown posteriorly, the anterior part bluish and purple, slightly iridescent and shining. *Hinge-line* long, very narrow. *Ligament* narrow, internal, extending nearly the whole length of the valves. Anterior *adductor-scar* behind the beak, round; posterior adductor-scar subcentral.

Length, 226 mm.; height, 125 mm.; diameter, 48 mm.

Type in the British Museum.

Hab.—Throughout New Zealand, in mud and sand, from low-water mark to a depth of several fathoms.

Fossil in the Eocene, Miocene, and Pliocene.

Suborder 2. SUBMYTILACEA.

Eulamellibranchia in which the mantle is only slightly closed; generally there is only a single suture. Siphons absent or very short. Gills smooth. Nearly always dimyarian.

Shell equivalve, with an external ligament.

Fam. MODIOLARCIDÆ, Gray.

Mantle with 2 sutures; the foot byssiferous, with a plantar surface and a glandular cavity in front of the byssogenous cavity; the two branchial plates serve as incubatory pouches.

Shell equivalve, covered with a hard polished epidermis. Hinge-teeth none or rudimentary; ligament linear, external.

Living attached to floating seaweeds.

Genus 1. MODIOLARCA, Gray, 1847.

Modiolarca, Gray, P.Z.S., 1847, 199. Type: *M. trapezina*, Lam. *Gaimardia*, Gould, 1852. *Phaseolicama*, Valenciennes, 1854.

Animal having the mantle united, with the exception of 3 openings —a small one for the foot, one branchial, and one anal; branchiæ unequal, the outer having only two-thirds the size of the inner; foot linguiform, grooved, byssiferous.

Shell ovate, trapezoidal, thin, fragile, ventricose; surface of valves covered with a smooth shining epidermis; beaks anterior, prominent, contiguous; anterior end compressed, sloping abruptly to the base; hind margin rounded, ventral margin somewhat sinuous and gaping anteriorly. Hinge with 2 small oblique teeth in the right valve, which receive 2 corresponding ones in the left. Muscular impressions distinct.

The genus is subantarctic.

KEY TO SPECIES.

A. Shell rostrate at the lower anterior end.
  a. Rostrum narrow, distinct; shell small, maximum length about 5 mm.
    b. Rostrum very short, acute; beaks near the anterior end — *acrobeles.*
    bb. Rostrum long and narrow; beaks at about the anterior third — *tasmanica.*
  aa. Rostrum broad, sometimes inconspicuous; maximum length of shell about 17 mm. — *trapezina.*
B. Shell oblong, not rostrate.
  a. Shell oblong, beaks a little in front of the middle; white and reddish — *Smithi.*
  aa. Shell subcylindrical, beaks nearly terminal — *pusilla.*

1. **Modiolarca acrobeles**, n. sp. Plate 52, fig. 5.

Shell very small, thin, transversely elongate, very inequilateral, the beaks nearly anterior, shortly rostrate in front, moderately ventricose, with a few indistinct radial lines, white. *Beaks* rounded, incurved, slightly turned forward, very near the anterior end. *Anterior end* very short, compressed, shortly but rather acutely rostrate below, the upper margin subvertical, excavated; *posterior end* long and broad, convex, the dorsal margin straight; ventral margin sinuated in front, descending and broadly rounded behind. *Sculpture* consisting of concentric growth-lines, and occasionally a few radial lines at the median part of the valves. *Colour* white, but fresh shells are very likely brown. *Interior* white (dead shells), smooth. *Margins* sharp, smooth.

Hinge: Right valve with 1 or 2 small teeth, which sometimes are obsolete; left valve usually with 1 small tooth only; all the teeth are roundish and situated below the umbo. *Ligament* subinternal, rather long, narrow. *Adductor-scars* distinct.

Dimensions of largest valve: Length, 4·2 mm.; height, 3 mm.; diameter, 1 mm.

Type in my collection.

Hab.—Near the Snares, in 50 fathoms (Captain Bollons).

Remarks.—In contour the species approaches *M. bicolor*, von Martens, and *M. kerguelensis*, E. A. Smith; both, however, are much larger shells, and certainly distinct.

2. Modiolarca pusilla, Gould, 1850. Plate 52, fig. 6.

Mytilus (*Modiolarca*) *pusillus*, Gould, P. Bost. S.N.H., iii, 1850, 345; U.S. Expl. Exp., xii, 455, atlas f. 585. *Modiolarca pusilla*, Gould: E. A. Smith, Phil. Trans. Roy. Soc., clxviii, 1879, 191; P. Mal. S., iii, 24; Index, 94; Iredale, T.N.Z.I., xl, 386.

Shell minute, thick and solid, transversely oval, inflated, subcylindrical. *Beaks* nearly terminal, elevated and tumid, somewhat excurved. Dorsal and basal margins nearly parallel; *anterior end* vertical, the basal angle obtuse; *posterior end* broadly rounded. *Sculpture* consisting of concentric growth-lines. *Epidermis* very delicate. *Colour* pale cinereous, sometimes tinted reddish. *Interior* clouded brown, and an intense red-brown; hinge-margin intense blood-red. *Hinge* with a single tooth in each valve, sometimes bifid. *Ligament* short.

Length, 5 mm.; height, 3·25 mm. (type).

Type in the U.S. Nat. Museum, Washington.

Hab.—Cape Saunders (Iredale); Antipodes Island (Captain Hutton); Campbell Island (Filhol); Macquarie Island (A. Hamilton). The type is from Tierra del Fuego.

3. Modiolarca Smithi, n.n. Plate 52, fig. 7.

Modiolarca bicolor, E. A. Smith, P. Mal. S., iii, 1898, 25, f. 3 in text: not of von Martens, 1885.

Shell minute, inequilateral, oblong, rather compressed laterally, white and reddish-brown. *Beaks* but little produced, in front of the middle, rounded. *Anterior end* shorter, narrowed, rounded, basal margin lightly convex; *posterior end* broader, convex, the dorsal margin straight or lightly curved. *Sculpture* consisting of fine dense concentric striæ. *Epidermis* thin, shining. *Colour*: Anterior and basal part of the valves white, umbones and posterior portion reddish-brown. *Interior* shining, white in front, reddish behind. *Margins* smooth, sharp. *Hinge* with 1 tooth in the left, 2 in the right valve. *Ligament* subinternal, small, oblique. *Adductor scars* fairly large; behind the anterior scar and under the umbo the valves are strengthened by a white callus.

Length, 3·5 mm.; height, 2 mm.; diameter, 1·5 mm.

Type in the British Museum; *co-type* in my collection.

Hab.—Macquarie Island (A. Hamilton).

Remark.—Distinguished from *M. pusilla*, Gould, and *M. minuta*, Dall, by its very different form, the anterior end being conspicuously produced and narrowed. (E. A. Smith.)

4. Modiolarca tasmanica, Beddome. 1881. Plate 52, figs. 8, *a*.

Modiolarca tasmanica, Beddome, P.R.S. Tas., 1880 (1881), 168; Tate and May, P.L.S. N.S.W., xxvi, 439, f. 12 in text; Verco, T.R.S. S.Aust., xxxi, 105.

Shell small, inequilateral, oval, rostrate in front, ventricose, smooth, reddish-brown. *Beaks* anterior, not much produced, rounded. *Anterior end* obliquely produced, forming an angle with the basal margin, which is distinctly sinuated in front, thus forming a conspicuous short rostrum; *posterior end* somewhat produced, regularly convex, the dorsal margin lightly arcuate. *Sculpture* consisting of very fine and close concentric striæ. *Epidermis* thin, slightly polished. *Colour* pinkish to reddish-brown, the anterior part usually whitish. *Interior* of the same colour, smooth. *Margins* smooth, sharp. *Hinge* with 2 small teeth; hinge-plate with 2 small pits anteriorly. *Ligament* narrow, subinternal. *Adductor-scars* fairly large, distinct.

Length, 5 mm.; height, 3 mm.; diameter, 2·8 mm.

Hab.—Near the Bounty Islands, in 50 fathoms (Captain Bollons). Also Tasmania, South Australia, and Victoria.

5. Modiolarca trapezina, Lamarck, 1836. Plate 63, fig. 6.

Modiola trapesina, Lamarck, A.s.V., ed. 2, vii, 1836, 24. *Modiolarca trapezina*, Lam., Conch. Cab., viii, pl. 6, f. 16, 17; Hanley, Cat. Rec. Biv. Shells, 237; Gray, Synopsis Brit. Mus., 1840, 151; P.Z.S., 1847, 199; Ad. G.R.M., iii, pl. 122, f. 1; Chenu, Man. Conch., ii, 156, f. 777; E. A. Smith, Chall. Rep., xiii, 279; Martens and Pfeffer, Moll. von Süd-Georgien, 127, pl. 4, f. 13; Pelseneer, Voy. "Belgica," 11. *Phaseolicama trapezina*, Lam.: Hupé, in Gay's Hist. Chile, Malacologia, pl. 8, f. 9. *P. magellanica*, Rousseau, Voy. P.S., 116, pl. 26, f. 2. *Gaimardia trapesina* (Lam.), Gould, U.S. Expl. Exp., xii, 459, atlas f. 568. *Modiolarca trapezina*, Lam., E. A. Smith, P. Mal. S., ii, 24; Index, 94.

Shell small, ovate-trapezoidal, thin and fragile, ventricose. *Beaks* near the anterior end, prominent, prosogyrate, contiguous. *Anterior end* compressed, sloping abruptly to the base, dorsal margin nearly rectilinear; *posterior margin* regularly rounded; ventral margin somewhat sinuous and gaping anteriorly, forming a small elliptical passage for the foot and byssus. *Sculpture* consisting of concentric growth-lines. *Epidermis* thin, shining. *Colour* usually pale olive, but occasionally bright yellow, orange, dark brown, and almost black. *Interior* always deep purple within the pallial impression, and rosy-white outside of it. *Hinge:* Right valve with 2 small oblique cardinal teeth, which receive 2 corresponding ones of the opposite valve; these teeth are frequently inconspicuous. *Ligament* narrow, short, partly internal. *Adductor-scars* quite distinct, the anterior surrounded by white callus.

Length, 17 mm.; height, 13 mm.; diameter, 8·5 mm.

Animal.—Couthouy, in U.S. Expl. Exp., xii, 459; S. P. Woodward, A.M.N.H. (2), xvi, 26.

Anatomy.—Pelseneer, Voy. "Belgica," 44.

Type in the Mus. Hist. Nat., Geneva.

Hab.—Auckland Islands (*fide* Pelseneer); Macquarie Island (A. Hamilton). Also Kerguelen, Marion, South Georgia, Falkland Islands, Tierra del Fuego, South Patagonia.

Remarks.—The shell is usually found attached to the large floating kelp *Macrocystis*.

The animal moves with considerable rapidity, as follows: The foot is doubled, so that its point is brought to its base; it is then extended to great length, carrying a byssal thread and attaching it to the object towards which it is moving; by a sudden contraction the shell is jerked forwards the length of the thread; this operation is repeated until the desired spot is reached, when it is there anchored by a number of threads thrown out in various directions. These threads are very elastic, and are found to proceed from the cavity at the base of the foot. (Couthouy.)

Fam. CRASSATELLITIDÆ, Dall.

Animal having a triangular, compressed, canaliculate foot; mantle perfectly open, without anal siphon, or forming only a single orifice, the anal; margins of mantle papillate posteriorly; labial palps triangular, of moderate size; gills unequal, the outer ones semilunar, the inner ones larger, especially in front.

Shell equivalve, thick, subtrigonal, the valves always somewhat unequal and usually more or less rostrate, the beaks compressed, erect, or hollowed behind; ligament internal, more or less obsolete; resilium large, wholly internal, attached at each end to a chondrophoric pit in the hinge-plate behind the cardinal teeth; lateral teeth and sockets usually alternated in the valves; the hinge-plate heavy, flat; the posterior cardinal in the right valve very small or obsolete, with no distinct socket in the opposite valve.

Lower Cretaceous to Recent.

Synopsis of Genera.

A. Shell moderately large, subtrigonal, solid, concentrically sulcate. Right valve with 2 cardinal teeth in front of the resilifer, the posterior stronger; left valve with 2 cardinals, the anterior stronger .. .. .. CRASSATELLITES.

B. Shell small, thin, resembling *Mactra*, smooth. Right valve with 2 diverging cardinal teeth, meeting at summit; left valve with 3 cardinal teeth, the median Λ-shaped .. CYAMIOMACTRA.

C. Shell small, smooth, cardinals similar to those of *Cyamiomactra*, but with a number of small lateral lamellæ in front and behind, crenulating the margins .. .. PERRIERINA.

D. Shell small, fairly solid, trigonal, higher than long, radiate or concentrically sculptured. Right valve with 1 triangular massive cardinal; left valve with 2 divergent cardinal teeth .. .. CUNA.

Genus 1. Crassatellites, Krüger, 1826.

Crassatellites, Krüger, Arch. neuest. Entdeck. Urwelt, ii, 1826, 466. Type: *C. sinuatus*, Krüger. *Crassatella*, Lamarck, 1801; not of 1799. *Pachythærus*, Conrad, 1869. *Scambula*, Conrad, 1869. *Crassitina*, Weinkauff, 1881.

Shell equivalve, solid, oblong-oval or subtrigonal, attenuated behind, close; margins of valves smooth or crenate; beaks small, contiguous; lunule distinct; ligament internal, attached to the resilifer; hinge-plate heavy; right valve with 1 anterior lateral tooth, 1 anterior cardinal tooth, 1 median strong cardinal, behind this the resilifer, and below it 1 rudimentary posterior cardinal tooth, and 1 very slender posterior lateral tooth; left valve with 1 anterior lateral tooth, 2 cardinal teeth, of which the anterior one is stronger, followed by the resilifer, below which there is a minute socket for the corresponding rudimentary cardinal of the opposite valve, and 1 long and strong posterior lateral tooth. Adductor-scars deep, rounded; anterior retractor-scar of the foot small, distinct, not confluent, situate above the anterior adductor-scar. Pallial line simple.

Distribution. — Australasia, Philippines, west coast of Africa, Canaries, Brazil.

Fossil.—Cretaceous, Eocene, and Miocene.

Key to Species.

A. Shell slightly produced and rounded posteriorly; lunule narrow and long .. .. *bellulus.*
B. Shell angled and truncated posteriorly; lunule shorter, lanceolate *obesus.*

1. Crassatellites bellulus, A. Adams, 1854. Plate 58, fig. 14.

Crassatella bellula, A. Adams, P.Z.S., 1852 (1854), 95; M.N.Z.M., 158; Hutton, P.L.S. N.S.W., ix, 526. *Gouldia isabella*, Hutton, C.M.M., 1873, 76.

Shell ovato-trigonal, subequilateral, yellow, concentrically plicated. *Beaks* sharply pointed, contiguous, the prodissoconch forming a minute cone with concentric striation, crowned by a convex cap. *Anterior end* shorter, regularly convex, the dorsal margin descending, straight; *posterior end* slightly produced and attenuated, narrowly rounded, the dorsal margin straight, descending; basal margin slightly rounded. *Lunule* distinct, deep, narrow, and elongate. *Escutcheon* narrow, excavated. *Sculpture* consisting of concentric strong wavy folds, which are rather crowded and are getting smaller and obsolete at the anterior and posterior ends. *Epidermis* thin, not shining. *Colour* uniformly yellowish-pink. *Interior* yellowish-white, porcellanous. *Margins* finely crenate. *Hinge* with the anterior cardinal tooth very slender. *Resilifer* elongately ovate, vertical. *Adductor-scars* subequal in size, the anterior more oval.

Length, 21 mm.; height, 15 mm.; diameter, 9 mm.

Type in the British Museum.

Hab.—New Zealand (Hart); Cook Strait.

Remark.—This is one of our rare shells, not found in many collections.

2. Crassatellites obesus, A. Adams, 1854. Plate 52, figs. 9, *a*.

Crassatella obesa, A. Adams, P.Z.S., 1852 (1854), 90, pl. 16, f. 2, 2*a*; M.N.Z.M., 158; Hutton, P.L.S. N.S.W., 526.

Shell equivalve, inequilateral, thick, gibbous, covered with brownish-red silky epidermis, transversely strongly plicated, folds prominent, vanishing towards the ventral margin; lunule impressed, lanceolate; posterior side subproduced, angled, margin truncated; anterior side gibbous, margin rounded. (A. Adams.)

Type in the British Museum.

Hab.—New Zealand, deep water (Strange).

Fossil in the Miocene.

Genus 2. Cyamiomactra, Bernard, 1897.

Cyamiomactra, Bernard, Bull. Mus. Hist. Nat., Paris, 1897, 311, f. 2; Dall, Trans. Wagn, Free Inst., iii, 1900, 1116; Hedley, P.L.S. N.S.W., 1905 (1906), 540. Type: *C. problematica*, Bernard.

Shell small, equivalve, inequilateral, resembling *Mactra* in form. Ligament internal, very oblique, nearly marginal. Muscular scars very little marked; pallial line not distinct, very likely uninterrupted. Left valve having in front of the resilifer a $\wedge$-shaped cardinal tooth, which does not reach the dorsal margin, and 2 divergent narrow teeth, one behind and one in front of the petaloid tooth. Right valve having in front of the resilifer 2 divergent teeth, united at the summit, the anterior of which is slightly bifid. In both valves anterior and posterior lateral teeth are present, distinct in young shells, but indistinct when adult.

Distribution.—Australasia.

1. Cyamiomactra problematica, Bernard, 1897. Plate 52, figs. 10, *a*, *b*.

Cyamiomactra problematica, Bernard, Bull. Mus. Hist. Nat., Paris, 1897, 311, f. 2; Hedley, P.L.S. N.S.W., 1905 (1906), 540, pl. 31, f. 7, 8.

Shell small, inequilateral to subequilateral, of very variable outline, thin and fragile, smooth, deep orange and white. *Beaks* contiguous, with the prodissoconch large, convex, and shining, slightly elevated. *Anterior end* attenuated, the dorsal margin sloping and straight, narrowly arched towards the slightly convex basal margin; *posterior end* higher, subtruncated or broadly rounded, the dorsal margin horizontal, very slightly descending. There is no *sculpture*, except very fine concentric growth-lines. *Epidermis* smooth, lightly shining. *Colour* bright orange from the beaks down over the posterior part of the valves, anteriorly white. *Interior* of the same colour as the outside, polished. *Margins* smooth, sharp. *Hinge* straight, with all

the characters as described for the genus. *Resilifer* very oblique. *Pallial line* simple, not interrupted.

Length, 4·5 mm. ; height, 3 mm. ; diameter, 1·8 mm.

Type in the Mus. Hist. Nat., Paris.

Hab.—Stewart Island, in 35 fathoms, type (Filhol) ; Foveaux Strait, in 15 fathoms (A. Hamilton) ; Bounty Islands, in 50 fathoms (Captain Bollons) ; twenty-one miles and a half north-east of Wreck Reef, in 50 fathoms ; twenty-four miles south-east of Long Point, in 120 fathoms (E. R. Waite).

Var. truncata, Suter. Plate 52, fig. 11.

Cyamiomactra problematica, Bernard, var. *truncata*, Suter, Sci. Results N.Z. Govt. Trawling Exp., 1907, pt. 2.

Differs from the species in the short subtrapezoidal form ; the anterior end being short and rounded, the posterior end truncate, with a distinct angle towards the basal margin ; between this and the beaks the valves show a distinct angle. It is an extreme form of the variable species, and well worthy of a varietal distinction, though intermediate forms are sometimes met with ; they, however, are never so distinctly angled.

Length, 4 mm. ; height, 3·5 mm. ; diameter, 2 mm.

Type in the Canterbury Museum, Christchurch.

Hab.—Twenty-one miles and a half north-east of Wreck Reef, in 50 fathoms (type) ; dredged at Waitangi, Chatham Islands (E. R. Waite) ; Bounty Islands, in 50 fathoms (Captain Bollons).

Genus 3. Perrierina, Bernard, 1897.

Perrierina, Bernard, Bull. Mus. Hist. Nat., Paris, 1897, No. 7, 312. Type and only known species : *P. taxodonta*, Bernard.

As there is only one species known, the characters of this must, for the present, be also those of the genus.

1. Perrierina taxodonta, Bernard, 1897. Plate 52, figs. 12, *a*, *b*.

Perrierina taxodonta, Bernard, Bull. Mus. Hist. Nat., Paris, 1897, No. 7, 312, f. 3 in text.

Shell very small, thin and fragile, oblong, equivalve, inequilateral, smooth, pellucid. *Beaks* with a large round prodissoconch, well marked off from the rest of the disc, not prominent, slightly directed forward. *Anterior end* shorter, very narrowly convex, the dorsal margin short, straight, descending ; *posterior end* broadly and regularly curved, the dorsal margin faintly rounded and very slowly descending ; basal margin strongly convex, ascending in front. *Sculpture :* None. *Epidermis* thin, shining. *Colour* pale-yellowish, mostly with distant brown divaricating bands. *Interior* smooth, shining, showing the colour-markings. *Margins* smooth, sharp. *Hinge-plate* very narrow, long ; right valve with a ∧-shaped cardinal in front of the resilium,

the posterior arm shorter, with about 5 oblique lateral lamellæ in front and 7 to 9 behind; left valve with 1 short curved median cardinal, which does not reach to the dorsal margin, and 2 oblique cardinals, one anterior and one posterior, which extend to the dorsal margin but are not united; the lateral lamellæ as in the other valve. *Ligament* internal, oblique, short, and narrow, a little behind the prodissoconch. *Adductor-scars* unequal, the anterior pyriform, the posterior roundish. *Pallial line* entire, simple.

Length, 3·5 mm.; height, 2·5 mm. (type).

Type in the Mus. Hist. Nat., Paris.

Hab.—Stewart Island, in 35 fathoms, type (Filhol); off Wreck Reef, in 50 fathoms (E. R. Waite); off Otago Heads (A. Hamilton); Snares, in 50 fathoms (Captain Bollons); Whangaroa Harbour (C. Traill).

Genus 4. Cuna, Hedley, 1902.

Cuna, Hedley, Mem. A.M., iv, pt. 5, 29, July, 1902, 314. Type: *C. concentrica*, Hedley. *Cuna*, Dall, Trans. Wagn. Free Inst., iii, pt. 6, 1467.

Shell very small, equilateral or slightly rostrate, higher than long, with lunule and impressed dorsal area, beaks erect, prodissoconch marked, valves sometimes clasping. Sculpture radiate or concentric, or both. Inner ventral margin usually denticulate. Hinge-plate broad and flat; in the left valve 2 well-developed cardinals; in the right a rudimentary cardinal and a massive projecting flat-topped and triangular cardinal. Laterals produced, sometimes transversely striated, a posterior and an anterior in each valve; posterior right and anterior left lateral margins fitting into sockets in the margin of the opposite valve. Resilium internal, behind the right posterior cardinal. Pallial line entire.

Distribution.—New Zealand, Tasmania, Australia, and Japan; in deep water.

Fossil in the Claibornian Eocene, Alabama.

Key to Species.

A. Shell with prominent close radiate riblets, about 15; interstices narrow .. .. *carditelloides.*
B. Shell with faint and narrow distant radiate riblets, about 10; interstices broad .. .. *delta.*

1. Cuna carditelloides, Suter. Plate 52, fig. 13.

Cuna carditelloides, Suter, Sci. Results N.Z. Govt. Trawling Exp., 1907, pt. 2.

Shell minute, trigonal, solid, slightly inequilateral, radially costate. *Beaks* contiguous, prodissoconchs minute, globose and smooth, surrounded by a narrow groove. *Anterior end* with the dorsal margin straight, descending, rounded towards the convex basal margin; *posterior end* similar to the anterior, but the dorsal margin feebly curved and angled towards the basal margin. *Lunule* distinct, long, lanceolate, with a few concentric ridges. *Sculpture* consisting of about

15 equidistant narrow smooth rounded radiate riblets, the interstices deep and narrower than the costæ; concentric undulating growth-lines are distinct only near the base. *Colour* white. *Interior* white, porcellanous, shining. *Basal margins* crenate. *Hinge* broad; the right valve with a stout triangular cardinal tooth, sometimes bifid; left valve with 2 divergent cardinal teeth, the posterior usually bifid. *Resilifer* small. *Adductor-scars* distinct, impressed. *Pallial line* simple.

Length, 2·5 mm.; height, 3 mm.; diameter, 1·5 mm.

Type in the Canterbury Museum, Christchurch.

Hab.—Off Lyttelton, in 100 fathoms (E. R. Waite).

2. Cuna delta, Tate and May, 1900. Plate 52, figs. 14, *a*, *b*.

Carditella delta, Tate and May, T.R.S. S.Aust., xxiv, 1900, 102; P.L.S. N.S.W., xxvi, 1901, 434, pl. 27, f. 100, 101; Hedley, Rec. A.M., iv, 1901, 23, f. 5. *Cuna delta*, T. & M.: Hedley, Mem. A.M., iv, 1902, 316; Rec. A.M., v, 1904, 87; T.N.Z.I., xxxviii, 1905 (1906), 73; Verco, T.R.S. S.Aust., xxxi, 1907, 109.

Shell very small, trigonal, rather solid, inequilateral, lightly radially ribbed. *Beaks* close together, the prodissoconchs small, smooth, conical. *Anterior end* somewhat produced, dorsal margin descending, straight, convex towards the regularly rounded basal margin; *posterior end* distinctly angled below. *Lunule* distinct, long, and narrow. *Escutcheon* similar to the lunule. *Sculpture* consisting of about 10 narrow, rounded, distant, and but little raised radiate riblets, very often obsolete, the interstices much broader than the riblets; concentric growth-lines distinct, especially towards the base. *Colour* very light brown. *Interior* of the same colour, shining. *Basal margins* slightly crenate. *Hinge* typical. *Resilifer* small. *Adductor-scars* very distinct. *Pallial line* simple.

Length, 2·3 mm.; height, 2·5 mm.; diameter, 1·4 mm.

Type in the Tasmanian Museum, Hobart.

Hab.—Off Great Barrier Island, in 110 fathoms; Cuvier Island, in 38 fathoms (Captain Bollons); north-east of Wreck Reef, in 50 to 54 fathoms (E. R. Waite); Foveaux Strait and Stewart Island, in 15 fathoms (A. Hamilton); Dusky Sound; near the Snares, in 50 fathoms (Captain Bollons). Also Tasmania and Australia.

Remarks.—The specimens from the Snares are considerably larger than those from the other localities. The type is from Derwent Estuary, Tasmania.

Fam. CARDITIDÆ, Férussac.

Animal marine; foot carinated, often byssiferous; there are no siphons; the border of the mantle is pierced for the excurrent orifice, while the incurrent orifice may or may not be complete. The gills are coarsely reticular, and usually united behind the foot. In many, if not all, cases the young are developed within the body-cavity of the mother, and retained there until some progress in secreting the nepionic shell has been made, in addition to the completion of the prodissoconch.

This incubation in one group takes place in the atrium of the ovary, in another in a specially developed fold of the ventral part of the mantle-lobes which secretes and lines a shelly marsupium which is absent in the shells of male individuals. Viviparous.

Shell equivalve, solid, cordiform, oval or transverse, usually with radial sculpture, the pedal adjacent to the anterior adductor-scar; ligament external, parivincular, resilium usually included in the ligament; hinge fully developed, with 1 or 2 cardinal teeth, and sometimes 1 or 2 laterals; the anterior cardinal often obsolete, the posterior prolonged parallel with the dorsal margin even below the ligament.

Trias to Recent.

KEY TO GENERA.

A. Shell strongly radially costate.
  a. Shell elongate-quadrate; right valve with 2 lamelliform smooth parallel cardinal teeth .. .. .. CARDITA.
  b. Shell rounded-trigonal; right valve with 3 or only 2 transversely finely striated cardinal teeth .. VENERICARDIA.
B. Shell smooth. Each valve with a single cardinal and 2 posterior teeth .. .. VERTICIPRONUS

Genus 1. CARDITA (Bruguière), Lamarck, 1799.

Cardita, Bruguière, Enc. Méth., i, 1792, 401; Lamarck, Prodrome d'une Nouv. Class. Coq., 1799, 86. Type: *C. calyculata*, L. *Mytilicardita*, Anton, 1839. *Jesonia*, Gray, 1840. *Mytilicardia*, Herrmansen, 1847. Not *Cardita*, Mörch, 1853 = *Isocardia*, Lam.

Animal with a short foot and a byssus with numerous fine filaments.

Shell elongate-quadrate, strongly radially ribbed, very inequilateral, and with a narrow byssal gape; lunule more or less depressed; hinge oblique; right valve with a feeble anterior lateral and 2 long lamelliform parallel cardinal teeth; left valve with a short anterior cardinal, an elongated posterior cardinal, and a small posterior lateral tooth; muscle-scars large and conspicuous; pallial line simple.

Distribution. — Mediterranean, coasts of Africa, Indian Ocean, Philippines, Australasia, &c.

Fossil in the Secondary and Tertiary.

1. Cardita calyculata, Linné, 1758. Plate 58, fig. 15.

Chama calyculata, L., Syst. Nat., ed. 10, 1758, 692. *Cardita calyculata*, L.: Lamarck, A.s.V., vi, 1819, 24; Hanley, Cat. Rec. Biv. Shells, 147, pl. 18, f. 7; Conch. Icon., i, pl. 1, f. 1; Chall. Rep., xiii, 14, 210; Suter, T.N.Z.I., xxxviii, 317. *C. aviculina*, Lamarck, A.s.V., vi, 1819, 26; Delessert, Recueil de Coq., 1841, pl. 11, f. 11; Hanley, Cat. Rec. Biv. Shells, 148, pl. 18, f. 24; Index, 92. *C. excavata*, Deshayes, P.Z.S., 1852 (1854), 100, pl. 17, f. 1–3; Chall. Rep., xiii, 210. *Mytilicardia excavata*, Deshayes, C.M.M., 76; Hutton, J. de Conch., xxvi, 52; M.N.Z.M., 160; *M. tasmanica*, T.-Woods, P.R.S. Tas., 1875 (1876), 161; Hutton, P.L.S. N.S.W., ix, 257. *M. calyculata*, L.: Pritchard and Gatliff, P.R.S. Vic., xvii (n.s.), 234.

Shell elongate-quadrate, very inequilateral, inflated, with radiate scaly ribs, sinuated and gaping below. *Beaks* near the anterior end, small, compressed, approximated. *Anterior end* very short, subtrun-

cated ; *posterior end* dilated, convex and ascending towards the dorsal margin, which is descending in front, angled on meeting the basal margin, which is nearly straight or strongly excavated. *Lunule* short, cordiform, with numerous vertical lamellæ. *Escutcheon* much impressed. *Sculpture* consisting of 12 to 14 strong scaly radiate ribs, the 6 to 7 anterior ribs smaller, the rest much stouter, rounded ; the interstices narrower than the ribs ; concentric growth-lines numerous, produced at regular intervals into convex scales upon the ribs. *Colour* yellowish-white, posterior ribs yellowish-pink or dirty-brown. *Interior* white, porcellanous, sometimes with brown spots, the external ribs marked by shallow grooves. *Margins* undulating, sharp. *Hinge-line* oblique, right valve with a very short anterior lateral and 2 long lamelliform cardinal teeth ; left valve with a short anterior and long lamelliform posterior cardinal tooth, posterior lateral short. *Ligament* short, external. *Adductor-scars* distinct, subequal. *Pallial line* simple.

Length, 32 mm. ; height, 18 mm. ; diameter, 19 mm. (large specimen).

Hab.—North and South Islands of New Zealand, and the Chatham Islands, from below low-water mark to about 50 fathoms. Also Tasmania, Australia, Mediterranean, off Tenerife in 70 fathoms (" Challenger ").

Fossil in the Pliocene.

Genus 2. VENERICARDIA, Lamarck, 1801.

Venericardia, Lamarck, Syst. A.s.V., 1801, 123. Types : *V. imbricata* and *V. planicosta*, Lam. *Cardissa*, Oken, 1815 ; not of Megerle, 1811. *Megacardita*, Sacco, 1899.

Animal with the foot large, bent, compressed, pointed in front, with a groove below, but no byssus. Anal orifice complete ; gills large, united posteriorly ; mantle-borders papillate at the branchial opening.

Shell rounded trigonal, strongly radially ribbed, the ribs frequently beaded, especially when young ; the lunule minute and deep, the escutcheon linear ; the internal margins crenate ; the hinge with 2 transversely striated cardinals in the left and 3 in the right valve, the laterals absent or obsolete, a sublunular pustule present in the left valve.

Distribution.—Northern seas, Mediterranean, west coast of Africa, Indian Ocean, west coast of America, Australasia, &c.

Fossil.—Eocene to Pliocene.

KEY TO SUBGENERA.

A. Right valve with 3, left with 2 cardinals ; no laterals ..	VENERICARDIA, s. str.
B. Right valve with the anterior and posterior cardinals feeble ; left valve with feeble anterior and posterior laterals	PLEUROMERIS.
C. Right valve with the posterior cardinal absent, with a feeble posterior lateral ; left valve with a feeble anterior lateral	MIODONTISCUS.

Subgen. 1. Venericardia, s. str.

Key to Species.

A. Right valve with 3 well-developed cardinal teeth.
  a. Ribs rounded; interstices narrower than the ribs; lunule cordate; interior stained with purple .. .. .. *australis.*
  b. Ribs sharp; interstices and ribs subequal; lunule almost circular; interior pure-white .. .. .. *difficilis.*
B. Right valve with 3 cardinal teeth, the anterior and posterior feeble.
  a. Valves suborbicular, with about 28 fine crenate ribs; lunule small, ovate; yellowish, spotted with brown or red .. *amabilis.*
  b. Valves ovate, with 14 strong beaded ribs; interstices a little broader than the ribs; lunule subcordate; colour brown *Bollonsi.*
  c. Valves subtrigonal, with 14 to 16 nodulous ribs, the interstices of the same width; lunule lanceolate; colour brown, sometimes with concentric reddish bands .. .. *zelandica.*
C. Right valve with a very strong triangular cardinal tooth, the anterior cardinal feeble, the posterior cardinal absent; valves ovato-trigonal, with 11 ribs .. .. *corbis.*

1. Venericardia australis, Lamarck, 1818. Plate 58, fig. 16.

Venericardia australis, Lamarck, A.s.V., v, 1818, 610; Gray, Dieff. N.Z., 256; Quoy and Gaimard, Voy. Astrol., iii, 1835, 480, pl. 78, f. 11–14; Index, 93. *Cardita australis*, Lam., Crit. List, 47; M.N.Z.M., 158; Hutton, P.L.S. N.S.W., ix, 527; C. Tert. M.B.M., 361. *C. purpurata*, Deshayes, P.Z.S., 1852 (1854), 100, pl. 17, f. 12, 13; M.N.Z.M., 159. *C. tridentata*, Reeve, Conch. Icon., i, f. 22. *Venericardia intermedia*, Hutton, C. Tert. M., 1873. 24.

Shell suborbicular, inequilateral, swollen, radially closely ribbed, brownish-white. *Beaks* obliquely recurved. *Anterior end* short, broadly convex, the dorsal margin slightly concave; *posterior end* produced, subtruncated, the dorsal margin slowly descending, lightly convex; basal margin broadly rounded. *Lunule* small, cordate. *Sculpture* consisting of about 20 to 22 nodulose radiating ribs, the nodules on the hinder side often subspinose; the interstices narrower than the ribs; concentric growth-lines distinct. *Colour* whitish to light brown, frequently with reddish spots at the umbones. *Interior* porcellanous, white, more or less marked with rosy or purple at the anterior and posterior ends. *Margins* plicated, thick. *Hinge-area* broad and heavy; the right valve with 3 strong cardinal teeth, all finely transversely striated; left valve with 2 cardinal teeth. *Ligament* strong, not very long, external. *Adductor-scars* subequal, well impressed. *Pallial line* distinct, simple.

Length, 46 mm.; height, 39 mm.; diameter, 26 mm.

Type in the Mus. Hist. Nat., Geneva.

Hab.—Throughout New Zealand and Chatham Islands; Kermadec Islands (Captain Bollons). It is common in Tasman Bay (Q. & G.), but not in the Hauraki Gulf.

Maori.—Purimu (*teste* Hutton).

Fossil.—Miocene and Pliocene.

2. Venericardia difficilis, Deshayes, 1854. Plate 58, fig. 17.

Cardita difficilis, Desh., P.Z.S., 1852 (1854), 103, pl. 17, f. 16, 17; M.N.Z.M., 159; Hutton, J. de Conch., xxvi, 51; P.L.S. N.S.W., ix, 527. *Venericardia difficilis*, Desh., Index, 93. *V. intermedia*, Hutton: von Ihering, Anales Mus. Nac. Buenos Aires, xiv, 1907, 83, 282, 284, pl. 10, f. 68; not of Hutton.

Shell ovato-transverse, inequilateral, swollen, radially ribbed, light brown. *Beaks* oblique, contiguous, pointed, curved inwards. *Anterior end* short, convex, dorsal margin concave; *posterior end* produced, subtruncated, the dorsal margin rather long, straight, very slowly descending; basal margin broadly convex. *Lunule* small, almost circular. *Sculpture* consisting of about 22 to 24 subangled, crenato-scaly, sharp ribs, crossed by numerous concentric growth-lines, the interstices subequal to the ribs. *Epidermis* thin, horny. *Colour* yellowish or brownish, rarely with faint reddish spots near the umbones. *Interior* porcellanous, pure-white. *Margins* crenate. *Hinge-area* moderately broad, solid; right valve with 3, left valve with 2 cardinal teeth, all transversely finely striated. *Ligament* short, conspicuous, external. *Adductor-scars* deeply impressed, subequal. *Pallial line* simple, distinct.

Length, 34 mm.; height, 30 mm.; diameter, 23 mm.

Type in the British Museum (Cuming collection).

Hab.—Near Little Barrier Island, in 20 fathoms; near Cuvier Island, in 38 fathoms (Captain Bollons); near Channel Island, Hauraki Gulf, in 25 fathoms; Foveaux Strait, in 15 fathoms (A. Hamilton): Stewart Island, in 18 fathoms (Captain Bollons).

Fossil.—Miocene and Pliocene.

Subgen. 2. PLEUROMERIS, Conrad, 1867.

Pleuromeris, Conrad, Amer. Journ. Conch., iii, 1867. Type: *Cardita tridentata*, Say; not of Reeve.

Shell small, subtriangular, nearly equilateral, the hinge like *Venericardia*, but the anterior and posterior right cardinals feeble, the left valve with feeble anterior and posterior laterals.

Miocene to Recent.

3. Venericardia amabilis, Deshayes, 1854. Plate 63, fig. 7.

Cardita amabilis, Desh., P.Z.S., 1852 (1854), 102, pl. 17, f. 8, 9; M.N.Z.M., 159; Webster, T.N.Z.I., xxxvii, 280.

Shell small, suborbicular, laterally compressed, subequilateral, radiately finely ribbed, yellowish-white spotted with reddish. *Beaks* small, incurved, contiguous, sharply pointed. *Anterior end* a little shorter, convex, the dorsal margin slightly concave; *posterior end* somewhat produced, broadly rounded; basal margin convex. *Lunule* small, ovate, flat, not deep. *Sculpture* consisting of 28 fine, rounded, crenato-scaly radiate riblets, the interstices narrower than the riblets. *Colour* yellowish-white, irregularly spotted with pale brown or red. *Interior* white, pinkish in the umbonal cavities. *Mar-*

gins crenate. *Hinge:* Right valve with a strong, triangular, oblique cardinal tooth, the anterior and posterior cardinals feeble; left valve with a long lamellar posterior and short triangular anterior cardinal tooth; laterals very small. *Ligament* rather short. *Adductor-scars* subequal, distinct. *Pallial line* simple.

Diameter—Ant.-post., 11 mm.: dorso-ventral, 10 mm.: thickness, 6 mm.

Type in the British Museum.

Hab.—New Zealand (Cuming). Cape Maria van Diemen, in a sponge (Webster). Tasmania and Australia.

Remark.—I have not seen New Zealand specimens.

4. **Venericardia Bollonsi,** Suter, 1907. Plate 53, figs. 1, *a*, *b*.

Venericardia (Pleuromeris) Bollonsi, Suter, P. Mal. S., vii, 1907, 211, pl. 18, f. 8–8*b*.

Shell small, ovate, solid, slightly inequilateral, and with nodulous radiate ribs. *Beaks* approximate, but little anterior, high and erect, prosogyrate, incurved; prodissoconch very small, pointed, and smooth. *Anterior end* with the dorsal margin descending and slightly concave, thence subangularly rounded; *posterior end* sharply convex, dorsal margin descending, long, and a little convex, basal margin regularly and broadly rounded. *Lunule* subcordate, finely striated. *Escutcheon* lanceolate, long and narrow, minutely striate, bounded by a carina. *Sculpture:* 14 strong radial beaded ribs with slightly broader interspaces; numerous concentric ridges, more prominent distally and at the base. *Colour* brown, much lighter towards the beaks. *Interior* white, porcellanous. *Margins* strongly fluted. *Hinge* solid; right valve with a stout triangular central cardinal, which is laterally microscopically striate, anterior and posterior cardinals not well developed, an anterior lateral tooth is distinct, the posterior very feeble; left valve with 2 divergent cardinals, the anterior stouter and triangular; a large lamelliform and marginal posterior lateral tooth is present, which is connected above with the posterior cardinal, the anterior lateral much less distinct, elongated and distant. *Ligament* very short. *Adductor-scars* oval, distinct, the anterior deeper. *Pallial line* simple and entire.

Length, 9 mm.; height, 8 mm.; diameter, 4·5 mm.

Type in my collection.

Hab.—Port Pegasus, Stewart Island, in 18 fathoms, type (Captain Bollons); off Otago Heads (A. Hamilton).

5. **Venericardia zelandica,** Deshayes, 1854. Plate 53, fig. 2.

Cardita zelandica, Desh., P.Z.S., 1852 (1854), 101; not *Venericardia zelandica*, Potiez and Michaud, 1838, which is *Chione Stutchburyi*, Gray. *C. lutea*, Hutton, M.N.Z.M., 159. *Venericardia lutea*, Hutton: Hedley, T.N.Z.I., xxxviii, 73, pl. 1, f. 6. *Cardita compressa*, Reeve: Hutton, P.L.S. N.S.W., ix, 527. *Venericardia compressa*, Reeve, Index, 93; not of Reeve.

Shell small, orbiculato-subtrigonal, subequilateral, pale-brownish, radially ribbed. *Beaks* approximate, small, pointed, incurved. *An-*

terior end somewhat shorter, convex, the dorsal margin descending, faintly concave; *posterior end* regularly convex, the dorsal margin sloping, basal margin rounded. *Lunule* lanceolate, excavated. *Sculpture* consisting of 14 to 16 regular, equidistant, radiate ribs, rendered nodulous or subsquamose by regular concentric lines, the interspaces equal to the ribs. *Epidermis* horny, often covered by a dark-brown coating. *Colour* pale or dark brown, rarely with a few concentric reddish bands. *Interior* white, porcellanous. *Margins* crenate. *Hinge* moderately broad; right valve with a strong median triangular cardinal, the anterior and posterior cardinals feeble; left valve with 2 divergent, strong, triangularly raised cardinals, the laterals feeble. *Ligament* short, external. *Adductor-scars* distinct, ovate, subequal. *Pallial line* simple.

Diameter—Ant.-post., 12 mm.; dorso-ventral, 13 mm.: thickness, 7·5 mm. (large specimen).

Type in the British Museum.

Hab.—Off Great Barrier Island, in 110 fathoms; near Cuvier Island, in 38 fathoms (Captain Bollons); near Channel Island, Hauraki Gulf, in 25 fathoms; Auckland Harbour.

Fossil in the Pliocene.

Subgen. 3. Miodontiscus, Dall, 1903.

Miodontiscus, Dall, Trans. Wagn. Free Inst., iii, pt. 6, 1409. *Miodon*, Carpenter, 1864; not of Sandberger, 1870, nor of Duméril, 1859. Type: *M. prolongatus*, Cpr.

Shell small, high, hinge with the posterior right cardinal absent and a posterior right and anterior left lateral feebly developed.

Pliocene to Recent.

6. Venericardia corbis, Philippi, 1836. Plate 53, fig. 3.

Cardita corbis, Phil., Enum. Moll. Siciliæ, i, 1836, 55. *Venericardia corbis*, Phil.: Suter, T.N.Z.I., xxxviii, 317. *Cardita unidentata*, Basterot.

Shell small, ovato-trigonal, solid, radially ribbed, subequilateral, yellowish-brown, with a few brown spots on the lunule. *Beaks* slightly raised, convex, incurved, sharply pointed. *Anterior end* slightly shorter, convex, the dorsal margin somewhat concave; *posterior end* and basal margin regularly rounded. *Lunule* large, lanceolate, not deep. *Sculpture* consisting of about 11 equal, rounded, radiate ribs, cut up, sometimes indistinctly, into nodules by concentric cords; interstices narrower than the ribs. *Colour* yellowish-brown, with a few chestnut spots on the lunule and sometimes on the median part of the valves. *Interior* white, the margins of the hinge-plate and the basal margin brown. *Margins* crenate. *Hinge area* moderately broad, solid; right valve with a stout triangular cardinal and a small anterior cardinal, posterior lateral feeble; left valve with 2 strong divergent cardinals and a distinct anterior lateral. *Ligament*

short, inconspicuous. *Adductor-scars* large, oval, subequal. *Pallial line* simple.

Diameter—Ant.-post., 5 mm.; dorso-ventral, 5·5 mm.: thickness, 3 mm.

Hab.—Near Cuvier Island, in 38 fathoms (Captain Bollons); near Little Barrier Island, in 20 fathoms (R. H. Shakespear); Stewart Island (A. Hamilton); near the Snares and Bounty Islands, in 50 fathoms (Captain Bollons); north of Enderby Island, in 85 fathoms (E. R. Waite). Also Mediterranean.

Genus 3. VERTICIPRONUS, Hedley, 1904.

Verticipronus, Hedley, Rec. A.M., v, pt. 2, 1904, 88. Type: *V. mytilus*, Hedley.

Shell small, higher than long, smooth, capped by a flat prodissoconch, ligament external, beaks terminal, hinge with a single prominent cardinal and 2 posterior teeth in each valve.

Distribution.—New Zealand.

1. Verticipronus mytilus, Hedley, 1904. Plate 53, figs. 4, *a*.

Verticipronus mytilus, Hedley, Rec. A.M., v, pt. 2, 1904, 88, f. 15 in text.

Shell small, rather solid, mytiliform, equivalve, inequilateral, the anterior side longest, non-nacreous, smooth, polished. *Beaks* terminal, obliquely truncate, capped by a flat, subtrigonal, radially wrinkled prodissoconch whose edges do not project. *Anterior end* high, convex, straight or concave above; *posterior end* broadly rounded, subangled at the middle, basal margin convex. *Lunule* minute, indistinct. *Sculpture* consisting of faint growth-lines only; well-marked periods of rest are often present. *Colour* russet to fawn; young shells are sometimes colourless and transparent. *Interior* brown. Ventral *margin* smooth. *Hinge* in each valve under the umbo, a prominent cardinal tooth and deep socket, and at the posterior angle 2 oblique successive lamelliform lateral teeth. *Ligament* moderately long, external. *Adductor-scars:* The posterior high up, the anterior small, at about half the height of the shell. *Pallial line* entire.

Diameter—Ant.-post., 1·6 mm.; dorso-ventral, 2·3 mm.: thickness, 1·4 mm. (type). Ant.-post., 3·5 mm.; dorso-ventral, 5·3 mm.: thickness, 3 mm. (large specimen from the Snares).

Type in the Australian Museum, Sydney.

Hab.—Whangaroa Harbour (C. Traill); Lyall Bay, type (A. Hamilton); Banks and Otago Peninsulas (Iredale); Taumaki Island, in 10 fathoms; Snares and Bounty Islands, in 50 fathoms (Captain Bollons).

Fam. CONDYLOCARDIIDÆ, Bernard.

Shell minute, related to the *Carditidæ*, but which retain in the adult state the immaturity of hinge characters which characterizes the nepionic shell of *Cardita*, and, moreover, have the resilium sunken

and centrally located between the valves. The prodissoconch in this group is of the usual size, but appears very prominent on account of the relatively small additions made to it in growth. As in *Cardita*, the margins have sometimes a projecting border externally, which under magnification appears quite prominent, but in the larger forms now added to the family is not especially noticeable. (Dall.)

The family comprises now the following genera: *Erycinella*, Conrad, 1845; *Carditella*, E. A. Smith, 1881; *Carditopsis*, E. A. Smith, 1881; *Condylocardia*, Bernard, 1897.

Eocene to Recent.

Genus 1. CONDYLOCARDIA, Bernard, 1897.

Condylocardia, Bernard, J. de Conch., xliv, 1896 (1897), 174. Type: *C. Pauliana*, Bernard. *Condylocardia*, Dall, Proc. Acad. N. Sci. Philad., 1902, 702; Trans. Wagn. Free Inst., iii, pt. 6, 1437.

Shell small, globose, equivalve, more or less inequilateral and produced in front. Beaks prominent, with an umbonal cavity which is formed by the embryonic shell, whose apex is rounded. Cardinal margin straight, short, formed exclusively by the cardinal margin of the embryonic shell. Hinge-plate well developed, covering the umbonal cavity. Anterior and posterior ends almost straight or curved, ventral margin regularly convex. Shell-substance compact, without nacreous or prismatic layer. Ligament internal, submedian, a little behind the middle. In the right valve the anterior margin of the shell is reflexed near the hinge-plate, and forms a hook which constitutes 2 cardinal teeth. Posteriorly there is the same disposition, but the teeth are more dorsal and rudimentary. There is an anterior lateral tooth, distant from the apex. Left valve with a prominent cardinal tooth on each side, continuous with a crest following the margin of the valve, which, becoming detached, forms a lamellar posterior lateral tooth. There are 2 subequal adductor-scars beneath the lateral teeth. Pallial line simple.

Distribution.—Islands of St. Paul and St. Helena, New Zealand, Australia, Tasmania.

Fossil in the Parisian Eocene.

KEY TO SPECIES.

A. Shell concentrically ribbed	*concentrica.*
B. Shell radially ribbed	*crassicosta.*

1. **Condylocardia concentrica**, Bernard, 1897. Plate 53, fig. 5.

Condylocardia concentrica, Bernard, J. de Conch., xliv, 1896 (1897), 176, pl. 6, f. 2; 180, f. 2 in text; 203, f. 5 (2) in text.

Shell minute, inequilateral, with prominent prodissoconch, concentrically ribbed. *Beaks* approximate, very conspicuous, prodissoconch with a broad projecting rim. *Anterior end* produced, descending, straight, subangled on meeting the convex basal margin: *posterior*

end much shorter, convex. *Sculpture* consisting of regular and close concentric riblets, interspaces narrower than the riblets; in cross-section the riblets are angular, the surface slightly excavated. *Colour* white. *Hinge* normal.

Diameter—Ant.-post., 1 mm.; dorso-ventral, 1·1 mm.: thickness, 0·5 mm.

Type in the Mus. Hist. Nat., Paris.

Hab.—Stewart Island, in 35 fathoms, type (Filhol); Foveaux Strait, in 15 fathoms (A. Hamilton); Bounty Islands, in 50 fathoms (Captain Bollons).

2. **Condylocardia crassicosta,** Bernard, 1897. Plate 53, figs. 6, *a*, *b*.

Condylocardia crassicosta, Bernard, J. de Conch., xliv, 1896 (1897), 175, pl. 6, f. 1; 187, f. 3 in text: May, P.R.S. Tas., 1908 (1909), pl. 6, f. 6.

Shell minute, oblique, inequilateral, with a conspicuous prodissoconch, radially costate. *Beaks* contiguous, the prodissoconch with a prominent exserted rim. *Anterior end* longer, margin descending, lightly convex, narrowly rounded towards the convex basal margin, which is ascending posteriorly; *posterior end* short, the dorsal margin straight, oblique, broadly angled on meeting the basal margin. *Sculpture* consisting of 7 to 8 rounded and smooth radiate riblets, the interstices subequal to the riblets. *Colour* white. *Basal margins* slightly crenate within. *Hinge* normal.

Diameter—Ant.-post., 1·3 mm.; dorso-ventral, 1·2 mm.: thickness, 0·8 mm.

Type in the Mus. Hist. Nat., Paris.

Hab.—Stewart Island, in 35 fathoms, type (Filhol); Foveaux Strait, in 15 fathoms (A. Hamilton); Banks Peninsula (Iredale); 21½ miles north-east of Wreck Reef, in 50–54 fathoms (E. R. Waite): Snares and Bounty Islands, in 50 fathoms (Captain Bollons). Also Tasmania.

Fam. **LUCINIDÆ**, d'Orbigny.

Animal having a fairly thick mantle, adherent in some places to the valves; pallial muscle large, the anal orifice of the mantle sometimes produced into a siphon; buccal orifice very small, the labial palps reduced to tubercles; gills large, thick, without an external plate; foot long, vermiform, distally swollen and pierced by a central canal; no byssiferous gland.

Shell-substance porcellanous or chalky, usually with inconspicuous epidermis, rounded, variably sculptured; valves equal, free, closed, with the beaks excavated in front; adductor and pedal scars adjacent or distinct, the latter small; anterior adductor elongated, largely within the pallial line, which is not sinuate; area within the pallial line often granular or punctate; cardinal area small, often deeply impressed; ligament and resilium subinternal, set in a deep groove, but usually more or less visible externally; hinge-plate distinct;

lateral laminæ distant from the cardinals, anterior and posterior in the right, with corresponding sockets in the left valve; cardinal teeth radial, 2 in each valve, the posterior tooth larger and often bifid, but any or all of the teeth may be obsolete or absent.

Silurian to Recent.

KEY TO GENERA.

A. Ligament very small, an internal resilium; right valve with 1 cardinal tooth .. .. LORIPES.
B. Ligament and resilium not internal; right valve with 2 cardinal teeth .. .. DIVARICELLA.
C. External ligament obsolete, a strong internal resilium; right valve with 1 narrow lamina having a minute cardinal hook at the proximal end .. .. MONTACUTA.

Genus 1. LORIPES, Cuvier, 1817.

Loripes, Cuvier, Règne Anim., ii, 1817, 482. Type: *Tellina lactea*, Gmel., not of Linné = *Loripes lucinalis*, Lamarck. Not *Loripes*, Schweigger, 1820. *Thyatira*, Gray, 1847; not of Hübner, 1816. *Ligula*, Menke, 1830; not of Montagu, 1803. *Lucinida*, d'Orbigny, 1846. *Lucinidea*, Barrois, 1887.

Animal with an elongated anal siphon, the branchial orifice not produced; foot extremely long, vermiform.

Shell tumid or compressed, suborbicular, with feeble sculpture; lunule narrow, elongate, an obscure anterior dorsal area indicated, but no posterior area or escutcheon; ligament almost or wholly internal, obsolete; the resilium deeply immersed; hinge with the posterior laterals and right anterior cardinal usually absent; margins entire, anterior adductor-scar long and narrow.

Distribution.—In most seas, but chiefly found in the Mediterranean, the West Indies, and Philippines.

1. **Loripes concinna**, Hutton, 1885. Plate 63, fig. 8.

Loripes concinna, Hutton, T.N.Z.I., xvii, 1884 (1885), 323; *op. cit.* xviii, 363; Plioc. M., 83, pl. 9, f. 90; Hedley, T.N.Z.I., xxxviii, 74.

Shell small, suborbicular, the beaks turned forward, concentrically finely ribbed, slightly inequilateral. *Beaks* slightly raised, convex, incurved. *Anterior end* a little longer, semicircular, the dorsal margin narrowly concave in front of the umbones; *posterior end* truncated at the middle, dorsal margin sloping, lightly convex, basal margin broadly rounded. *Lunule* lanceolate, the left half narrower. *Sculpture* consisting of regular, fine, and sharp concentric riblets, the interspaces of about the same width. *Colour* light brown to whitish. *Interior* white, porcellanous, the area inside the pallial line radially striate. *Margins* finely crenate. *Hinge:* Right valve with a large triangular and oblique cardinal, occasionally bifid, and an anterior and posterior feeble lateral tooth; left valve with 2 diverging cardinal teeth, a triangular socket between them, lateral teeth obsolete. *Ligament* partly external, with a shorter resilium. *Adductor-scars:*

The anterior larger, elongated, the posterior shorter. *Pallial line* distinct, simple.

Diameter—Ant.-post., 7·5 mm.; dorso-ventral, 7·2 mm.: thickness, 4·2 mm.

Type, from the Pliocene, in the Canterbury Museum, Christchurch.

Hab.—Off Great Barrier Island, in 110 fathoms; near Cuvier Island, in 38 fathoms, live specimens (Captain Bollons); near Channel Island, in 25 fathoms.

Fossil in the Miocene and Pliocene.

Genus 2. Divaricella, von Martens, 1880.

Divaricella, von Martens, Beitr. z. Meeresfauna von Mauritius und Seychellen, 1880, 321. Type: *Lucina angulifera*, v. Mts. = *ornata*, Reeve, not of C. B. Adams. *Cyclas*, Mörch, 1853; not of Lamarck, 1799. *Egraca*, Leach, 1852. *Strigilla*, Turton, 1822. *Lucina* of many authors. *Loripes*, Wood, 1840.

Valves suborbicular, convex, subequilateral, with inconspicuous beaks, no dorsal areas, 2 cardinal teeth in each valve, the laterals variable, the posterior distant, usually obsolete; the anterior feeble, adjacent. Ligament and resilium set in a groove, but not internal; the excavated striæ forming an angle on a line radial from the beaks.

Fossil in the Tertiary. It appears first in the Eocene of Australia, and most likely migrated from there to New Zealand.

1. Divaricella Cumingi, A. Adams and Angas, 1863. Plate 58, fig. 18.

Lucina (*Cyclas*) *Cumingi*, Ad. & Ang., P.Z.S., 1863, 426, pl. 37, f. 20; Chall. Rep., xiii, 177. *L. divaricata*, Lamarck: Gray, Dieff. N.Z., 257; Hutton, C.M.M., 74; J. de Conch., xxvi, 51; M.N.Z.M., 155; not of Lamarck. *L. dentata*, Wood: Hutton, P.L.S. N.S.W., ix, 525; not of Wood. *Divaricella Cumingi*, Ad. & Ang., Index, 92; Hedley, T.N.Z.I., xxxviii, 74.

Shell orbicular, subglobose, rather thin, with divaricate sculpture, nearly equilateral, rather thin, posterior extremity truncate. *Beaks* contiguous, but slightly raised, directed forward, slightly in front of the centre, concentrically finely striate. *Anterior end* and basal margin regularly rounded, the *posterior end* squarely truncate. *Lunule* long and narrow, tapering anteriorly; the anterior area below the lunule sharply defined, with irregular concentric striæ. *Sculpture* consisting of rather distant sharp ridges forming an angle on a line from the beaks to the anterior part of the basal margin, the ridges much closer at the angle; interstices much broader than the ridges, with fine concentric growth-lines. *Colour* white. *Interior* white, porcellanous, not shining. *Margins* smooth, sharp. *Hinge:* Right valve with a strong triangular cardinal tooth in the centre and a deep pit on either side, a smaller oblique cardinal in front, directed forward; the anterior lateral is a large tubercle with a deep chink where the adductor-scar

truncates it, the posterior lateral distinct, short; left valve with 2 diverging cardinals, the anterior triangular, heavy, usually bifid; the anterior lateral tooth similar to that of the right valve, posterior lateral obsolete. *Ligament* fairly long, external, the nymphæ well developed. Anterior *adductor-scar* long and narrow, the posterior scar short and oval. *Pallial line* simple.

Diameter—Ant.-post., 29 mm.; dorso-ventral, 27 mm.: thickness, 15 mm.

Type in the British Museum.

Hab.—Bay of Islands; near Little Barrier Island, in 20 fathoms; Channel Island, Hauraki Gulf, in 25 fathoms; Auckland Harbour; Whangarei Heads; Nelson; Sumner; Dusky Sound, in 12 fathoms; Chatham Islands; off Great Barrier Island, in 110 fathoms; Kermadec Islands (Captain Bollons). The type is from St. Vincent Gulf, South Australia (Angas). Found also in Port Jackson, Tasmania, Ceylon.

Remark.—Lives buried in sand in deep water, and therefore only obtained by dredging, or found washed up on the beach after heavy gales.

Fossil.—Eocene to Pliocene.

Var. **Huttoniana,** Vanatta, 1901.

Lucina (*Divaricella*) *Huttoniana*, Vanatta, Proc. Acad. Nat. Sci. Philad., Feb. 1901, 184, pl. 5, f. 14, 15.

Distinguished from the species by having a long narrow lunule, more delicate texture, and lower beaks; it is also much less globose.

Altitude, 29·5 mm.; diameter, 32 mm.; thickness of right valve, 8 mm.

Type in the collection Acad. Nat. Sci., Philadelphia.

Hab.—Auckland.

Genus 3. MONTACUTA, Turton, 1822.

Montacuta, Turton, Dithyra Brit., 1822, 58. Type: *M. substriata*, Mtg. *Tellimya*, Brown, 1827.

Animal with the gills on each side with only the direct and reflected inner lamina developed; hepatic glands arborescent, projecting from the ordinary body-wall.

Shell small, more or less transversely ovate, posterior end usually shorter; anterior part of the hinge provided, in the right valve, with a narrow lamina having a minute cardinal hook at the proximal end; the left valve with a similar lamina on which the hook is less prominent or even absent; external ligament obsolete, amphidetic, leaving no traces on the shell; resilium strong, internal, posterior, seated on nymphs of which the right one is usually less strong; the ventral surface of the resilium, in the larger species, with a thin calcareous deposit, often wholly absent and never forming a developed lithodesma; the distal portions of the laminæ sometimes obsolete. (Dall.)

Distribution.—European seas, coasts of North America, Australasia. The type is from deep water on the Devonshire coast.

Fossil in the Tertiary.

1. Montacuta triquetra, n. sp. Plate 53, figs. 7, *a*.

Shell very small, thin and fragile, subtrigonal, truncated behind, inequilateral, smooth, white. *Beaks* not prominent, contiguous, small, pointed. *Anterior end* produced, sharply rounded, the dorsal margin descending, straight; *posterior end* shorter, slightly angled at the middle and truncated below, the straight dorsal margin descending, basal margin faintly convex. An elongated *lunular area* is slightly indicated. *Sculpture* consisting of very fine concentric striæ only. *Colour* white. *Interior* white, smooth. *Margins* simple, thin and sharp. *Hinge-line* very narrow; right valve with an anterior long and narrow lamina and a well-pronounced cardinal tooth, which is narrowly triangular and situate just in front of the beak; left valve with a broadly elevated, sometimes obsolete, cardinal tooth in front of the umbo. *Resilium* posterior, rather long and narrow, the nymph of the right valve better developed than that in the left valve. *Adductor-scars* subequal, within the *pallial line*, which is continuous and simple.

Diameter—Ant.-post., 3·7 mm.; dorso-ventral, 3·3 mm.: thickness, 2 mm.

Type in my collection.

Hab.—Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons).

Fam. DIPLODONTIDÆ, Dall.

Animal with the external limb of the gills developed, reflected, and sometimes appendiculate, the adductor muscles not projecting into the discs of the mantle, without siphons, the foot long, vermiform.

Shell subcircular in outline, rarely nestling and irregular; hinge with the laterals obscure or absent, valve-margins plain; the adductor-scars continuous peripherally with the pallial line.

Cretaceous to Recent.

Genus 1. DIPLODONTA, Bronn, 1831.

Diplodonta, Bronn, Italiens Tertiär Gebilde, 1831, p. ix. Type: *Venus lupinus*, Brocchi; not *Diplodon*, Spix, 1827. *Mysia*, Brown, 1833. *Egeria*, Lea (in part); not of Roissy, 1805. *Sphærella*, Conrad, 1838. *Glocomene*, Leach, 1852. *Cycladicama*, Valenciennes, 1854. *Mittrea*, Gray, 1857.

Animal with double gills, without siphons, the generative and digestive glands contained within the general mass of the body. Foot long, vermiform, with a terminal glandiform swelling, not perforated, and without a byssus gland; labial palps moderately elongated, subtrigonal.

Shell rotund, equilateral, externally concentrically striated or smooth, with inconspicuous epidermis; 2 cardinal teeth in each

valve, of which the right posterior and left anterior are distally sulcate or bifid; no lateral teeth; the hinge-plate when developed is usually excavated distally; there is no circumscribed lunule or escutcheon; the adductor-scars are subequal, continuous with the pallial line, and close to the hinge-plate; the margin is entire, the pallial line simple, the pallial area often radiately striate.

Distribution.—Antilles, Brazil, European seas, Red Sea, Indian Ocean, Chinese seas, California, Australasia, &c.

Fossil.—Cretaceous and Tertiary.

Vernacular Name.—Double-tooth.

Remark.—The type is from the Miocene of Italy.

KEY TO SPECIES.

A. Shell smooth, with fine growth-lines only.
  a. Shell much inflated, with prominent ventricose beaks, very thin .. .. *globularis.*
  b. Shell lenticular, valves moderately convex, beaks but slightly elevated, fairly solid .. .. *zelandica.*
B. Shell somewhat irregularly concentrically distinctly ridged, globose .. .. *striata.*

1. Diplodonta globularis, Lamarck, 1818. Plate 58, fig. 19.

Lucina globularis, Lamarck, A.s.V., v, 1818, 544; Hanley, Cat. Rec. Biv. Shells, 77, pl. 14, f. 16; Conch. Icon., vi, pl. 9, f. 53; Crit. List. 46. *Mysia globularis*, Lam.: Hutton, C.M.M., 75; P.L.S. N.S.W., ix, 525. *Diplodonta globularis*, Lam.: Hutton, J. de Conch., xxvi, 51; M.N.Z.M., 156; Index, 92; Pritchard and Gatliff, P.R.S. Vic., xvii (n.s.), 224.

Shell orbicular, inflated, with prominent ventricose beaks, inequilateral, almost smooth, thin, horny-white. *Beaks* much inflated, approximate, incurved and directed forward, sharply pointed. *Anterior end* convex, the dorsal margin horizontal; *posterior end* narrowly rounded, the dorsal margin lightly curved, descending; basal margin regularly rounded. *Sculpture* consisting of very fine concentric growth-lines of variable strength. *Epidermis* thin, dull, of horny colour. *Colour* greyish-brown, the beaks whitish. *Interior* white, not shining, the interpallial area sometimes faintly punctate. *Margins* thin and sharp. *Hinge-plate* narrow, arched; right valve with a high, pointed, and rather slender anterior, and a strong, broad, bifid cardinal tooth; left valve with a rather feeble and slightly sulcate anterior and a lamellate, triangularly raised posterior cardinal tooth. *Ligament* moderately long, external, the nymphæ well developed. *Adductor-scars* oblong, close to the margin, and continuous with the *pallial line*, which is simple.

Diameter—Ant.-post., 28 mm.; dorso-ventral, 25 mm.: thickness, 20 mm.

Type in the Mus. Hist. Nat., Geneva.

Hab.—Stewart Island, in 12–20 fathoms; Banks Peninsula; 21½ miles north-east of Wreck Reef, in 50–54 fathoms; off Oamaru,

in 40 fathoms; twenty-four miles south-east of Long Point, in 120 fathoms (E. R. Waite); Bounty Islands, in 50 fathoms (Captain Bollons). Also Tasmania and Australia. The type is from King George Sound, Western Australia.

Fossil in the Pliocene.

2. Diplodonta striata, Hutton. 1878. Plate 63, fig. 9.

Lucina novæ-zelandiæ, Reeve, Conch. Icon., vi, 1850, f. 14. *Mysia novæ-zelandiæ*, Reeve: Hutton, C.M.M., 75. *Diplodonta novæ-zelandiæ*, Reeve, Crit. List, 46; not of Gray, 1835. *D. striata*, Hutton, J. de Conch., xxvi, 1878, 51; M.N.Z.M., 156; Index, 92. *Mysia striata*, Hutt., P.L.S. N.S.W., ix, 525.

Shell somewhat globose, inequilateral, thin, irregularly concentrically ridged. *Beaks* slightly raised, swollen, approximate, curved inward and forward, pointed. Dorsal margins almost horizontal, lightly convex, the others circular in outline. *Sculpture* consisting of rather irregular flattish concentric ridges, lamellate near the margins. *Epidermis* thin, light brown. *Colour* whitish to very light brown. *Interior* white, not shining. *Margins* thin and sharp. *Hinge-line* straight, narrow; right valve with a small triangular anterior and a broader sulcate posterior cardinal tooth; left valve with a broad bifid anterior and small lamellar posterior cardinal tooth. *Ligament* rather short, high, exterior. *Adductor-scars* subequal, oblong, near the margin. *Pallial line* simple.

Diameter — Ant.-post., 15 mm.; dorso-ventral, 14 mm.: thickness, 11 mm.

Type in the British Museum.

Hab.—New Zealand (Cuming); Kapiti Island and Titahi Bay, Cook Strait; Auckland Harbour; Banks Peninsula (Iredale); Chatham Islands.

On mud-banks and in rock-fissures at and below low-water mark.

3. Diplodonta zelandica, Gray, 1835. Plate 63, fig. 10.

Lucina zelandica, Gray: Yate, N.Z., 309; Dieff. N.Z., 256. *Mysia zealandica*, Gray, C.M.M., 75. Hutton, P.L.S. N.S.W., ix, 525. *Diplodonta zelandica*, Gray: Hutton, J. de Conch., xxvi, 51; M.N.Z.M., 156; Smith, Ereb. & Ter., ii, 1874, 6, pl. 3, f. 8; Index, 92; Gatliff, P.R.S. Vic., xx (n.s.), 36. *Lucina inculta*, Gould, P. Bost. S.N.H., iii, 1850, 255; U.S. Expl. Exp., xii, 413, atlas f. 524; Crit. List, 46. *Diplodonta tasmanica*, T.-Woods, P.R.S. Tas., 1876 (1877), 158; Tate and May, P.L.S. N.S.W., 1901, 432, pl. 27, f. 102; Hedley, *op. cit.*, 1904, 196.

Shell small, fairly solid, lenticular, subequilateral, nearly circular in outline, valves moderately convex, whitish, with concentric growth-lines. *Beaks* slightly elevated, rather compressed, acutely triangular, incurved, a slight depression in front of them rendering the anterior half a little less elevated than the posterior. *Anterior end* somewhat acutely rounded; *posterior* and basal margins circularly rounded, most depending portion a little behind the middle. *Sculpture* consisting of fine concentric growth-lines. *Epidermis* thin, smooth, light

brown. *Colour* white, brownish where the epidermis is left; sometimes light flesh-colour. *Interior* dirty-white, dull. *Margins* thin, smooth. *Hinge* delicate; right valve with a high and narrow anterior and stronger bifid cardinal tooth; left valve with the posterior cardinal tooth oblique, lamellar, the anterior triangular, high, and deeply sulcate. *Ligament* rather short, conspicuous, external. *Adductor-scars* subequal, oblong, continuous with the simple pallial line.

Diameter—Ant.-post., 22 mm.; dorso-ventral, 21 mm.: thickness, 12 mm.

Type in the British Museum.

Hab.—Bay of Islands; near Channel Island, Hauraki Gulf, in 25 fathoms; Auckland Harbour, on mud-banks near low-water mark; Banks Peninsula; Chatham Islands; Kermadec Islands (Captain Bollons). Also Tasmania and Australia.

Fossil in the Miocene and Pliocene.

Fam. THYASIRIDÆ, Dall.

Cryptodontidæ.

Animal without siphons, the foot long, vermiform, with a distal swelling.

Shell small, usually thin, subglobular, the posterior end furrowed, without a lunule, ligament partly external; hinge edentulous or with cardinals and laterals.

Genus 1. THYASIRA, Lamarck, 1818.

Thyasira, Lamarck, A.s.V., v, 1818, 492 (in synonymy). Type: *Tellina flexuosa*, Montagu. *Thyatira*, Jeffreys, 1839. *Bequania*, Brown, 1827. *Axinus*, Sowerby, 1821; not *Axina*, Kirby, 1817. *Cryptodon*, Turton, 1822. *Clausina*, Jeffreys, 1847; not of Brown, 1827. *Ptychina*, Philippi, 1836. *Megaxinus*, Brugnone, 1881. *Conchocele*, Gabb, 1866. *Schizothærus*, Locard, 1896; not of Conrad, 1853.

Animal with the mantle-borders thick, without siphons; foot very long and thin, nearly cylindrical, with an oval swelling at the end: visceral mass with arborescent excrescences.

Shell thin to subsolid, subglobular, earthy; beaks turned forward: posterior side furrowed; lunule absent; ligament placed in a groove in the hinge-line, partly external; hinge edentulous, the hinge-margin indented in front of the beaks, which forms a pseudo-tooth; muscular impressions superficial, elongated; pallial line simple; borders of the shell closed, simple.

Distribution.—North Atlantic and Pacific, European seas, Australasia.

Fossil in the Tertiary.

Vernacular Name.—Hatchet-shell.

KEY TO SPECIES.

A. Anterior end shorter than the posterior .. .. .. *flexuosa.*
B. Anterior end much longer than the posterior .. .. *otagoensis.*

1. Thyasira flexuosa, Montagu, 1803. Plate 63, fig. 11.

Venus sinuosa, Donovan, Nat. Hist. Brit. Sh., 1801, pl. 12, f. 2; not of Pennant, 1777. *Tellina flexuosa*, Montagu, Test. Brit., 1803, 72. *Amphidesma flexuosa*, Lamarck, A.s.V., v, 1818, 492. *Lucina sinuata*, Lamarck *op. cit.*, v, 1818, 543: Hanley, Cat. Rec. Biv. Shells, 1844, 77. *Ptychina biplicata*, Philippi, En. Moll. Sicil., i, 1836, 15; ii, 1844, 4. *Lucina sinuosa*, Thorpe, Brit. Man. Conch., 1844, 74; not of Römer. *Cryptodon bisinuatus*, S. Wood, A.M.N.H., vi, 1840, 247. *Axinus sinuatus*, Philippi, Zeitschr. Malak., 1845, 91. *Cryptodon* sp., Hutton, C.M.M., 75. *Axinus flexuosus*, Mont.: Fischer, Man. Conch., pl. 19, f. 7. *Cryptodon flexuosus*, Mont., Chall. Rep., xiii, 192. *Lucina flexuosa*, Mont.: Forbes and Hanley, Brit. Moll., ii, 54, pl. 35, f. 4. *Thyasira flexuosa*, Mont.: Dall. Trans. Wagn. Free Inst., iii, pt. 6, 1339; Hedley, T.N.Z.I., xxxviii. 1906, 74.

Shell delicate and fragile, inequilateral, suborbicular, with a posterior sulcus, convex, pellucid, white, smooth. *Beaks* rather prominent, small and acute, inclined forwards. *Anterior end* smaller and narrower than the posterior, the front dorsal edge sloping downwards, slightly excavated in front of the beaks; *posterior end* angularly produced, the dorsal margin oblique, straight, lightly angled on meeting the convex posterior margin, which has a distinct sinus at the termination of the furrow extending from the apex; basal margin convex. There is a faint roundish *lunular impression* in front of the umbones. *Sculpture* consisting of irregular concentric wrinkles. *Colour* white. *Interior* white, shining, radially striated. *Margins* smooth, sharp. *Hinge-line* narrow, angular, the right valve with an erect pseudo-tooth below the beak. *Ligament* moderately long, but little visible from the outside, nymphæ not much developed. *Adductor-scars* elongate, the anterior impression double. *Pallial line* simple.

Diameter — Ant.-post., 19 mm.; dorso-ventral, 17 mm.: thickness, 13·5 mm.

Type in the British Museum.

Hab.—Off Great Barrier Island, in 110 fathoms; Waikanae Beach, Cook Strait; Wet Jacket Arm, Dusky Sound, in 12 fathoms; Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons). Also Australia, northern Europe, North Atlantic south to the Canaries and Azores, Mediterranean, north-east North America, in 2 to 500 fathoms.

Fossil in the European Neocene and Pleistocene.

2. Thyasira otagoensis, n. sp. Plate 53, fig. 8.

Shell small, orbicular, slightly ventricose, inequilateral, with a feeble posterior fold, thin and pellucid, smooth, whitish. *Beaks* prominent, convex, inclined forward, approximate. *Anterior end* produced, considerably longer than the posterior end, semicircular, the dorsal margin slowly descending, basal margin regularly curved; *posterior end* short, regularly convex, with a slight excavation at the terminus of the feeble fold descending from the beaks. *Sculpture*

consisting of fine concentric growth-lines. *Colour* whitish. *Interior* white, polished. *Margins* smooth, sharp. *Hinge-line* narrow, curved, with a minute pseudo-tooth under the beaks, a little more distinct in the left valve. *Ligament* rather short, narrow, but very little of it visible on the outside. *Adductor-scars* subequal, elongate. *Pallial line* simple.

Diameter—Ant.-post., 4·5 mm.; dorso-ventral, 4·5 mm.: thickness, 3 mm.

Type in my collection.

Hab.—Off Otago Heads, dredged by Mr. A. Hamilton (type); Milford Sound, in 100–120 fathoms, dredged by the scientific party which visited the Sounds in December, 1908.

Fam. LEPTONIDÆ, Gray.

Animal marine, mantle without siphons and with 3 openings—an anterior branchial, a median pedal, and a posterior anal. Gills with 2 gill-plates; foot long and byssiferous. Hermaphrodite and incubatory.

Shell cellular-crystalline, with a periostracum; valves equal, free, smooth-edged, often gaping, variably sculptured; adductor-scars peripheral, subequal; pallial line simple; area obscure or none; ligament parivincular, opisthodetic, external, often obsolete; resilium usually internal, subumbonal or oblique; hinge-plate narrow, channelled to receive the resilium; hinge variable, normally consisting of 1 or 2 radiating cardinals and a pair of lateral laminæ in each valve, the anterior laminæ often absent, and the posterior frequently closely adjacent to the resilium, simulating cardinals.

Cretaceous to Recent.

Synopsis of Genera.

A. Hinge with 1–2 minute cardinals and 2 laterals in each valve, the latter sometimes double in the right valve. Resilium oblique, behind the beaks .. .. Erycina.

B. Hinge with 2 cardinals, sometimes forming a Λ-shaped tooth, and 2 posterior laterals, the anterior laterals absent or feeble. Resilium large, under the beaks .. .. Kellia.

C. Right valve with an anterior triangular tooth and a hooked lamella above it, 2 posterior lamellæ; left valve with 1 anterior hooked cardinal and 1 oblique posterior lamella.. Neolepton.

D. Shell inequilateral, anterior end longer. Right valve with 1 pustular cardinal and 1 pair of laminæ on each side; left valve with 1 cardinal and 2 laminæ diverging from the umbo .. .. Lasæa.

E. Shell with prominent divaricate sculpture; 1 cardinal in each valve, anterior and posterior laterals double in the right valve. Resilium in a sulcus below posterior lamella .. Myllita.

F. Each valve with a pair of lamellæ on each side of the resilium .. Pachykellya.

G. Right valve with 2 diverging cardinals, the resilium between them, and 2 laterals; left valve with 2 simple laterals .. Rochefortia.

H. Right valve with 1 or 2, left valve with 2 or 3 cardinals; no laterals; ligament obsolete, resilium oblique .. .. Cyamium.

Genus 1. Erycina, Lamarck, 1804.

Erycina, Lamarck, Ann. du Muséum, vi, 1804, 413. Type: *E. pellucida*, Lamarck. Not *Erycina*, Philippi, 1836, nor of Brown, 1833. *Neœromya*, Gabb, 1873.

Shell small, somewhat compressed or not very convex, exterior concentrically striate, smooth, or rarely with partially radial sculpture, sometimes punctate or sagrinate; hinge with an obsolete external ligament, sometimes hardly traceable, and a well-marked internal resilium which is attached to the shell in an oblique fossette behind the beaks and close to the cardinal border; teeth, normally, 1 or 2 minute cardinals and 2 lateral laminæ in each valve, the latter near and sometimes confounded with the dorsal margin of the valve, usually long, low proximally, more elevated distally, and often recurved upon themselves, like a segment of a cylinder; in the right valve sometimes double, with the socket for the laminæ of the opposite valve between them. Pallial line with a slight insinuation. (Dall.)

Fossil in the Tertiary.

Key to Species.

A. Anterior end produced and acutely rounded below, posterior end subtruncate. Sculpture: minute linear markings .. .. *bifurca.*
B. Both ends regularly rounded. Sculpture: minute punctures .. *parva.*

1. Erycina bifurca, Webster, 1908. Plate, 53, figs. 9, *a*.

Kellia bifurca, Webster, T.N.Z.I., xl, 1907 (1908), 257, pl. 21, f. 24–29.

Shell very small, inequilateral, somewhat quadrate, pale grey. *Beaks* directed forwards, pointed, shining, prodissoconch and first one-third of the shell white, translucent, and devoid of sculpture. *Anterior end* slightly longer than the posterior, produced and acutely rounded below; *posterior end* short, subtruncate; basal margin feebly convex. *Sculpture* at first glance somewhat resembling *E. parva*, but a closer examination reveals the linear markings, which, though irregular, have one general direction; the concentric growth-lines are very marked, dividing the entire shell into bands, in each of which the sculpture varies somewhat. *Colour* pale grey, white at the umbones. *Interior* with 2 clumsy patches of varying shape in different specimens, extending downwards and outwards from behind the hinge; in young specimens these are milky, and may be seen through the shell; in mature shells these patches spread and thicken clumsily in such a manner as to seriously diminish the capacity of the shell. *Hinge:* 1 cardinal tooth in each valve, sometimes accompanied by a small point under the umbo in the right valve and a clumsy thickening of the margin in the left valve; an anterior and posterior lateral in each valve; in some specimens a second posterior in each valve. No external *ligament*, but a large posterior *resilium*. *Pallial line* entire.

Diameter—Ant.-post., 4 mm.; dorso-ventral, 3·25 mm.; thickness, 2 mm.

Type in Mr. Webster's collection.

Hab.—Orua Bay, Manukau Harbour; plentiful in 3 fathoms.

I have not seen this species.

2. Erycina parva, Deshayes, 1856. Plate 53, figs. 10. *a*, *b*.

Kellia parva, Deshayes, P.Z.S., 1855 (1856), 182; Tryon, Proc. Acad. N. Sci. Philad., 1872, 231. *Erycina parva*, Desh.: Hedley, T.N.Z.I., xxxviii, 74. *E. acupuncta*, Hedley, Mem. A.M., iv, 1902, 321, f. 60 in text.

Shell small, inflated, oblong, finely punctate. *Beaks* not prominent, broadly convex. *Anterior end* slightly longer than the posterior, both rounded, the dorsal margins straight, gently sloping; basal margin almost straight. *Sculpture* consisting of fine punctures, arranged in curved oblique lines, and distinct concentric lines. *Colour* a dirty white. *Interior* whitish, with concentric white bands, polished. *Margins* smooth, solid. *Hinge:* In each valve a roundish cardinal tooth, and anterior and posterior lateral tooth, both of which are solid and arcuately raised. *Resilium* posterior, small. *Adductor-scars* subequal. *Pallial line* simple, entire.

Diameter — Ant.-post., 3·3 mm.; dorso-ventral, 2·4 mm.: thickness, 2 mm.

Type in the British Museum (Cuming collection).

Hab.—Off Great Barrier Island, in 110 fathoms; near Cuvier Island, in 37 fathoms (Captain Bollons); Narrow Neck, Auckland Harbour, in sand (H. S.); Queen Charlotte Sound, in 16 fathoms (Captain Bollons); Dusky Sound, in 30 fathoms; Stewart Island, in 18 fathoms. Also off New South Wales, in 41 to 75 fathoms.

Fossil in the Pliocene.

Genus 2. Kellia, Turton, 1822.

Kellia, Turton, Dithyra Brit., 1822, 56. Type: *K. suborbicularis*, Mtg. *Tellimya*, Sect. i, Brown, 1827. *Chironia*, Deshayes, 1839. *Oronthea*, Leach, 1852. *Goodalliopsis*, R. & M.-C., 1863. *Zoe*, Monterosato, 1878. *? Divarikellia*, Cossm., 1887.

Animal: Both gills with direct and reflected inner and outer laminæ; the viscera are contained within the body-mass. Hermaphrodite.

Shell rounded and inflated, concentrically striated or smooth: with an obsolete amphidetic external ligament and a large strong internal resilium without a lithodesma; in its fullest development with 2 anterior and 2 posterior teeth in each valve, of which the anterior ones are shorter and usually regarded as cardinals, which may be concrescent at their umbonal ends, forming a Λ-shaped tooth, or may be free and pustular; the interior face of the valves commonly shows radial striation, and the valves are frequently distorted, through the effect of the nestling habit.

The species retain the young between the valves until pretty well grown, and these young are much more compressed than the adult

shells. In many species the dental formula is not fully represented by developed teeth. (Dall.)

The genus is cosmopolitan.

Fossil in the Tertiary.

1. **Kellia suborbicularis,** Montagu, 1804. Plate 63, figs. 12, *a*.

Mya suborbicularis, Mtg., Test. Brit., 1804, 39, 564, pl. 26, f. 6. *Kellia suborbicularis*, Mtg.: Turton, Dithyra Brit., 1822, 57, pl. 11, f. 5, 6: Forbes and Hanley, Brit. Moll., ii, 1853, 87, pl. 18, f. 9; pl. O, f. 4: E. A. Smith, Chall. Rep., xiii, 201: P. Mal. S., v, 163: Dall, Trans. Wagn. Free Inst., iii, pt. 5, 1155. *? Lepton fabagella*, Conrad, Am. Mar. Conch., ii, 1831, 53, pl. 11, f. 3. *? Montacuta Gouldii*, Thompson, Am. Journ. Conch., iii, 1867, 33, pl. 1, f. 15. *Erycina rotunda*, Deshayes, P.Z.S., 1855, 181. *Kellia rotunda*, Desh., Chall. Rep., xiii, 202, pl. 11, f. 5. *Erycina cycladiformis*, Deshayes, Traité Elém. de Conch., pl. 11, f. 6–9; P.Z.S., 1855, 181. *Kellia cycladiformis*, Desh.: Hutton, C.M.M., 75; J. de Conch., xxvi, 51; M.N.Z.M., 157; Melvill and Standen, Scott. Nat. Antarctic Exp., 1907, 149. *K. suborbicularis*, Mtg.: Hedley, P.L.S. N.S.W., 1905, 543.

Shell small, ovato-subrotund, ventricose, thin and fragile, moderately inequilateral, yellowish-brown, glossy, sometimes slightly iridescent. *Beaks* rather prominent, inclined forward, small and very acute, contiguous. *Anterior end* somewhat shorter than the posterior, regularly or bluntly rounded; *posterior end* broad, somewhat produced below, rounded or bluntly sub-biangulated; basal margin lightly convex. *Sculpture* consisting of very fine concentric lines. *Epidermis* delicate, glossy, yellowish-brown. *Interior* white, not shining. *Hinge:* A large elongated triangular rather oblique resilium, situated close under the beaks on the posterior side (interrupting the hinge-margin, and causing, when removed, an apparent cavity in it). Right valve with a single erect somewhat recurved primary tooth immediately under the apex of the shell, and a feeble secondary tooth in front; behind the resilium a second erect primary tooth and a faint posterior lamella. Left valve with 2 adjacent primary teeth in front of the resilium, the anterior tooth continued as a lamella in front; behind the resilium a primary tooth, sometimes obliquely erect and ending in a short lamella behind. *Adductor-scars* rather large, ovate, subequal, high up. *Pallial line* distinct, entire.

Diameter—Ant.-post., 13 mm.; dorso-ventral, 11 mm.: thickness, 8 mm. (a large specimen).

Type in the British Museum.

Hab.—Bay of Islands; Hauraki Gulf; Banks Peninsula. Stewart Island, in 18 fathoms; Chatham Islands: from low-water mark to about 60 fathoms. Also Tasmania, Australia, Kerguelen Island, Burdwood Bank (in 56 fathoms), South Africa, British Islands, Norway, Mediterranean, Massachusetts, Canary Islands, St. Helena, Mazatlan, &c.

Genus 3. NEOLEPTON, Monterosato, 1875.

Neolepton, Monterosato, Atti Acad. Palermo, 1875, 12. Type: *Lepton squamosum*, Montagu.

Shell inflated, concentrically striate, more or less inequilateral, impunctate; hinge composed in the right valve of an anterior large triangular tooth, surmounted by a hooked fine lamella, and behind the central oblique resilium 2 diverging lamellæ; left valve with an anterior hook-shaped cardinal and an oblique posterior lamella.

Bernard considers the hinge of *Neolepton* as being very distinct from that of *Kellia* and *Lepton*, and forming one of the primitive stades in the series of the *Heterodonta*. Dr. W. H. Dall. however, is of opinion that Monterosato's genus has only sectional value under the genus *Lepton*. (Trans. Wagn. Free Inst., iii, pt. 5, 1139.)

KEY TO SPECIES.

a. Shell thin and fragile, white, translucent; anterior end slightly longer .. .. *antipodum.*
b. Shell fairly solid, length only 2 mm., yellowish; anterior end slightly shorter .. .. *citrinum.*
c. Shell rather solid, whitish with red umbones, nearly equilateral *sanguineum.*

1. Neolepton antipodum, Filhol, 1880. Plate 53, figs. 11, *a*, *b*.

Kellia antipodum, Filhol, Comptes Rend. Acad. Sci., xci, 1880, 1095; Miss. I.C., 1885, 543; Hutton, P.L.S., N.S.W., ix, 526. *Neolepton antipodum*, Filhol: Bernard, Bull. Mus. Hist. Nat., Paris, 1897, 314; Hedley, T.N.Z.I., xxxviii, 74, pl. 1, f. 5.

Shell very small, ovate-subrotund, inequilateral, pellucid, with regular concentric striæ. *Beaks* prominent, contiguous, small, inclined forwards. *Anterior end* slightly longer than the posterior end, acutely convex, the dorsal margin nearly straight, descending; *posterior end* broadly rounded, the sloping dorsal margin straight and shorter; basal margin regularly arched. *Sculpture* consisting of regular, fine, sharp concentric lines. *Colour* white. *Interior* white, polished. *Margins* thin and sharp. *Hinge:* Right valve with a triangular large anterior cardinal and a fine long posteriorly hooked lamella above it, the resilifer under the beak, and behind it 2 rather long diverging lamellæ; left valve with an anterior elongated lamella, hooked near the resilifer, and with an oval tooth anteriorly, behind the middle an elongated and triangularly raised lamella. The anterior *adductor-scar* is very small, the posterior scar oval and continuous with the pallial line.

Diameter — Ant.-post., 2·6 mm.; dorso-ventral, 2·3 mm.: thickness, 1 mm.

Type in the Mus. Hist. Nat., Paris.

Hab.— Campbell Island, Venus Bay; under stones, near low-water mark; type (Filhol): Bounty Islands, in 50 fathoms; Port Pegasus, Stewart Island, in 18 fathoms; near Cuvier Island, in 38 fathoms (Captain Bollons); off Great Barrier Island, in 110 fathoms. Also Victoria (Gatliff).

2. Neolepton citrinum, Hutton, 1883. Plate 53, fig. 12.

Kellia citrina, Hutton, N.Z.J.S., i, 1883, 477; T.N.Z.I., xvi, 1883 (1884), 215; P.L.S. N.S.W., ix, 525; Index, 91.

Shell minute, ovato-rotund, finely concentrically striate, slightly inequilateral, somewhat inflated, yellowish. *Beaks* prominent, swollen, approximate, slightly inclined forwards. *Anterior end* slightly shorter than the posterior, acutely rounded at the middle; *posterior end* regularly convex; basal margin broadly rounded. *Sculpture* consisting of regular concentric sharp lines. *Colour* pale-yellowish. *Interior* yellowish-white, polished. *Margins* smooth. *Hinge:* Right valve anteriorly with a large basal tooth, hooked at its posterior end, surmounted by a thin lamella which is equally hooked; the resilifer narrow, oblique; behind it 2 long lamellæ, the lower one much stronger; left valve with a rather stout triangular tooth, consisting of 2 swellings connected by a thin lamina; behind the resilifer a rather strong elongated lamella. *Adductor-scars* subequal, round.

Diameter — Ant.-post., 2 mm.; dorso-ventral, 1·75 mm.: thickness, 1·3 mm.

Type in the Canterbury Museum, Christchurch.

Hab.—Tamaki Heads, near Auckland, type (T. F. Cheeseman); Narrow Neck and Maloney's Reef, Hauraki Gulf (H. S.), in sand at low-water mark.

3. Neolepton sanguineum, Hutton, 1883. Plate 53, figs. 13, *a*, *b*.

Kellia sanguinea, Hutton, N.Z.J.S., i, 1883, 478; T.N.Z.I., xvi, 1883 (1884), 215; P.L.S. N.S.W., ix, 526. *Neolepton sanguineum*, Hutton: Bernard, Bull. Mus. Hist. Nat., Paris, 1897, 313, f. 4 in text (hinge); Index, 92.

Shell minute, ovato-rotund, swollen, subequilateral, concentrically striate, whitish with red at the umbones. *Anterior end* very little shorter than the posterior, both regularly convex, basal margin broadly rounded. *Sculpture* consisting of fine, regular, sharp concentric lines. *Colour* yellowish-white, the umbones bright carmoisin or flesh-colour. *Interior* white with dashes of red towards the beaks, polished. *Margins* smooth. *Hinge:* Right valve anteriorly with a large triangular tooth near the ventral border, and a long slender lamina above, which is hooked posteriorly, behind the oblique resilifer 2 diverging laminæ united below the beak; left valve with an anterior hook-shaped strong tooth and a posterior lateral lamina. *Adductor-scars* subequal, ovate, distinct.

Diameter — Ant.-post., 3 mm.; dorso-ventral, 2·7 mm.: thickness, 1·7 mm.

Type in the Canterbury Museum, Christchurch.

Hab.—Foveaux Strait (type); Whangaroa Harbour (C. Traill); Lyttelton Harbour (H. S.); off Dunedin Heads (A. Hamilton); Port Pegasus, Stewart Island, in 18 fathoms; near the Snares, in 50 fathoms (Captain Bollons). Also Victoria (Gatliff).

Genus 4. Lasæa, Leach, 1827.

Lasæa (Leach), Brown, Ill. Conch. Gr. Brit., ed. 1, 1827, pl. 20, f. 17, 18. Type: *Cardium rubrum*, Montagu. *Lasea*, Gray, 1847. *Autonoë*, Leach, 1852. *Cycladina*, Cantraine, 1846. *Poronia*, Récluz, 1843. *Anapa*, Gray, 1847. *Kellia*, Turton, 1842.

Animal: The genus is remarkable for having gills in which the inner lamina is both direct and reflected, while the outer one is represented by the direct portion only. The hepatic and generative glands are included within the general mass of the body. Hermaphrodite. (Pelseneer, Voy. "Belgica," 1903, 47.)

Shell small, not gaping, ovato-rotund, inflated, inequilateral, the anterior end longer; hinge-plate large, interrupted in the middle, with a great variability in the development of the teeth; right valve with a pustular cardinal, and on each side of it a pair of laminæ between which the single lamina of the opposite valve is received; left valve with a minute pustular cardinal and 2 laminæ diverging from the subumbonal region. The so-called cardinal is very often wanting, and the laminæ are irregular, and part of them often missing. The resilium is enormous in proportion to the size of the shell, its ventral surface with, in fully developed specimens, a thick chalky layer; it is inserted along the ventral margin of the hinge-plate or laminary platform. Adductor-scars oval Pallial line entire.

Distribution.—Cosmopolitan.

The known species are nestlers, adhering by a byssus to the rugosities of calcareous algæ, barnacles, &c., and the young are long retained within the parent shell.

Key to Species.

A. Shell with fine concentric striæ only; minute, ovato-rotund, beaks broadly rounded .. .. *miliaris.*
B. Shell concentrically striate, and with fine wrinkles and punctures.
a. Hinge-margin pinkish, the anterior lateral teeth short .. *scalaris.*
b. Hinge-margin white, the anterior laterals long .. .. *neozelanica.*

1. Lasæa miliaris, Philippi, 1845. Plate 53, fig. 14.

Lasæa miliaris, Phil., Wiegman's Archiv f. Naturgesch., 1845, 51. *Kelliela miliaris*, Phil.: von Ihering, An. Musco Nac. Buenos Aires, xiv, 1907, 552. *Bornia seminulum*, Philippi. *Modiolarca minutissima*, Iredale, T.N.Z.I., xl, 387.

Shell minute, ovato-rotund, inflated, inequilateral, smooth, reddish-brown. *Beaks* not much raised, rounded, straight, approximate. *Anterior end* longer than the posterior, slightly oblique, the dorsal margin horizontal, straight; *posterior end* semicircular, basal margin broadly convex. *Sculpture* consisting of exceedingly fine concentric striæ. *Colour* reddish-brown or yellowish with pink on the dorsal parts. *Interior* of the same colour, smooth. *Margins* sharp and smooth. *Hinge-plate* well developed, the right valve with a central small pit and a pustular cardinal in front of it, the 2 anterior laterals

very short and stout, the upper tooth mostly reduced to a tubercle, the 2 posterior laterals longer, very often rudimentary; left valve with 2 oblique lamellæ behind the central resilifer, and 2 oblique short lamellæ in front, the inner of which is sometimes minute and may be taken as the cardinal tooth. *Resilium* large, calcareous, extending from the centre along the whole lower posterior part of the hinge-plate. *Adductor-scars* oval, the anterior larger. *Pallial line* entire.

Diameter — Ant.-post., 3 mm.; dorso-ventral, 2·5 mm.: thickness, 2 mm.

Hab.—Banks Peninsula; Dunedin Harbour (A. Hamilton); Snares and Bounty Islands, in 50 fathoms (Captain Bollons); Chatham Islands; Auckland Islands (Professor Benham); Campbell Island (Professor Chilton); Macquarie Island (A. Hamilton). The type is from the Mediterranean. The species is also recorded from the North Atlantic, Cape of Good Hope, and Strait of Magellan.

2. **Lasæa neozelanica**, n. sp. Plate 54, fig. 1.

Shell small, ovato-rotund, inequilateral, somewhat inflated, concentrically striate and finely wrinkled, yellowish-brown. *Beaks* prominent, slightly inclined forward, pointed, contiguous. *Anterior end* longer than the posterior, produced and narrowly convex below, the dorsal margin faintly convex and descending; *posterior end* regularly rounded, acutely convex towards the broadly rounded basal margin. *Sculpture* consisting of well-marked irregular concentric striæ, the interspaces with fine wrinkle striation and punctures. *Epidermis* thin, shining, horny. *Colour* yellowish-brown. *Interior* bluish-white, shining. *Margins* smooth, sharp. *Hinge-plate* well developed, arcuate; right valve with a central narrow cardinal, 2 lateral teeth in front, the lower one stronger and triangularly raised distally, and 2 laterals at the posterior end, the lower one also better developed and raised towards the end; left valve with a rather stout central cardinal tooth, 1 sharp lamina in front, and 1 lateral tooth behind, which has a tubercular excrescence at the end of the resilifer, which is long, extending from the centre along the greater length of the lower part of the posterior hinge-plate. *Adductor-scars* distinct, the anterior larger, oval, the posterior smaller, roundish. *Pallial line* entire.

Diameter — Ant.-post., 7 mm.; dorso-ventral, 6 mm.: thickness, 4·5 mm.

Type in my collection.

Hab.—Port Pegasus, Stewart Island, in 18 fathoms, type (Captain Bollons); near Little Barrier Island, in 20 fathoms (R. H. Shakespear).

Remarks.—This species is nearest to *L. rubra*, but the anterior lateral teeth are much better developed, longer, the concentric sculpture is much finer than is usually the case in the type, the colour is different, and the hinge-margin has no trace of red colour.

3. Lasæa scalaris, Philippi, 1847. Plate 53, fig. 15.

Poronia scalaris, Phil., Zeitschr. f. Malak., iv, 1847, 72; Angas, P.Z.S., 1867, 926. *Lasæa scalaris*, Phil.: Hedley, Mem. A.M., iv, pt. 5, 321. *Poronia Parreyssi*, Philippi, *op. cit.*, 73. *P. purpurata*, Phil., *op. cit.*, 73. *P. rugosa*, Récluz, J. de Conch., iv, 1853, 50, pl. 2, f. 4, 5. *P. australis*, Souverbie, J. de Conch., xi, 1863, 287, pl. 12, f. 8; Angas, P.Z.S., 1867, 926. *Kellia balaustina*, Gould, P. Bost. S.N.H., viii, 1861, 34.

Shell small, oval, oblique, inflated, inequilateral, concentrically striated, yellowish-brown stained with pink. *Beaks* prominent, convex, incurved, somewhat excavated in front, pointed. *Anterior end* produced, much longer than the posterior, narrowly convex at the middle, the dorsal margin rounded and gently sloping; *posterior end* semicircular, basal margin lightly rounded. *Sculpture* consisting of concentric striæ, sometimes rather coarse and fine wrinkles and punctures. *Colour* yellowish-brown with pink at the dorsal parts. *Interior* whitish, the hinge-margin and anterior end pink, smooth. *Margins* thin, smooth, and sharp. *Hinge-plate* well developed, angular, right valve with a small triangular cardinal, 2 very short triangularly raised anterior laterals, and 2 elongated curved posterior lamellæ, the lower one stronger and raised at the end; left valve with a minute cardinal, 1 tubercular small anterior lateral, and 1 elongated posterior lateral, above which there is usually a subparallel fine lamella. *Resilium* large, extending from the centre towards the posterior lower part of the hinge-plate. *Adductor-scars* distinct, the anterior larger, oval, the posterior smaller, roundish. *Pallial line* entire.

Diameter—Ant.-post., 7 mm.; dorso-ventral, 5·5 mm.: thickness, 4·5 mm.

Hab.—Taumaki Island, in 10 fathoms (Captain Bollons); Stewart Island. Also Australia, Tasmania, &c.

Genus 5. Myllita, d'Orbigny and Récluz, 1850.

Myllita, d'Orb. & Récl., J. de Conch., i, 1850, 292. Type: *Erycina Deshayesii*, Récluz. *Mylitta*, Kobelt, 1878. *Pythina*, T.-Woods, Hutton.

Shell equivalve, solid, surface punctate or sagrinate, with concentric, radial, or divaricate sculpture; ligament external, obsolete, amphidetic; resilium strong, internal, seated in a conspicuous sulcus below the lower posterior lamina, the mesial portion with a calcareous coating; valves with a small anterior and posterior dorsal gape, but closed ventrally; hinge with a single left anterior and posterior lamina and a single left cardinal; right valve with a cardinal and double anterior and posterior laminæ, the cardinals often bifurcate; mantle completely open below between the adductors, and probably covering more or less of the exterior of the valves; pallial line simple, with large adductor-scars; foot strong, with a conspicuous byssal sulcus; the young incubated in the generative or peripheral atrium, small, vitreous, and numerous. (Dall.)

Distribution.—Australia, Tasmania, New Zealand.

1. Myllita Stowei, Hutton, 1873. Plate 54, fig. 2.

Pythina Stowei, Hutton, C.M.M., 76; J. de Conch., xxvi, 51; M.N.Z.M., 157; P.L.S. N.S.W., ix, 526; E. A. Smith, A.M.N.H. (6), viii, 1891, 230, pl. 13, f. D–F.

Shell small, transversely oval, thin, whitish, equilateral, divaricately ribbed. *Beaks* prominent, convex, roundly pointed, contiguous. *Anterior end* rounded, subangled above on meeting the nearly horizontal dorsal margin; *posterior end* similar to the anterior, but the dorsal margin slightly sloping, basal margin straight. *Sculpture:* The whole surface minutely sagrinate, with sharply raised, distant, divaricating riblets, the angles in a straight vertical line from the apex to the base, the interstices much broader than the riblets; towards the margin a few concentric growth-lines. *Colour* greyish-white. *Interior* white, polished, showing the divaricate sculpture. *Margins* crenate. *Hinge:* Right valve with a bifid cardinal just in front of the umbo, 2 short anterior laterals, and 2 longer raised posterior laterals; left valve with 1 cardinal, 1 short anterior lateral, and 1 longer posterior lateral tooth; the posterior long resilifer at the base of the hinge-plate usually terminating in a tubercle. *Adductor-scars* large, subequal. *Pallial line* simple.

Diameter — Ant.-post., 13 mm.: dorso-ventral, 7 mm.: thickness, 5 mm. (large specimen).

Type in the Dominion Museum, Wellington

Hab.—Islet Reef, Cook Strait (type); Hauraki Gulf, fixed to the under-side of stones by the byssus (H. S.); Bay of Islands (J. C. Anderson): Foveaux Strait, in 15 fathoms (A. Hamilton).

Genus 6. Pachykellya, Bernard, 1897.

Pachykellya, Bernard, Bull. Mus. Hist. Nat., Paris, 1897, 309. Type and only species known: *P. Edwardsi*, Bernard.

1. Pachykellya Edwardsi, Bernard, 1897. Plate 54, figs. 3, *a*, *b*.

Pachykellya Edwardsi, Bernard, *op. cit.*, 309, f. 1 in text.

Shell minute, equivalve, inequilateral, higher than long, elongated anteriorly. *Beaks* much inclined forward, approximate, with a minute globular prodissoconch. *Anterior end* produced below, the dorsal margin descending; *posterior end* much shorter, regularly curved, basal margin convex. There is no umbonal cavity. *Sculpture* consisting of very fine, sharp, and regular concentric striæ. *Colour* white, semitransparent, shining. *Interior* white, smooth, with a straight line running obliquely from the dorsal part of the anterior muscle-scar to the end of the lateral lamella opposite. *Margins* simple. *Hinge-plate* interrupted in the middle by the oblique internal resilium; each valve with a pair of lamellæ on each side of

the resilium, which is the most important character of the genus; they are nearly parallel to the edges of the valves, the anterior ones more elongated than the posterior ones; the dorsal lamellæ are recurved at their upper extremity, forming a hook over the adjacent lamellæ; the lamellæ of the right valve are more dorsal than those of the left. *Resilium* internal, below the beaks, oblique. *Adductor-scars* much impressed, the posterior nearer the apex.

Diameter—Ant.-post., 1 mm.; dorso-ventral, 2 mm. (type).

Type in the Mus. Hist. Nat., Paris.

Hab.—Stewart Island, in 35 fathoms, type (Filhol); Foveaux Strait, in 15 fathoms (A. Hamilton).

Genus 7. Rochefortia, C. Vélain, 1876.

Rochefortia, Vélain, "Comptes Rendus," 1876; Archive Zool. Expérim., vi. 1876, 132. Type: *R. australis*, M.-Ch. & Vél. *Montacuta* (sp.), Turton, Dithyra Brit., 1822, 60. *Anatina*, Brown, Ill. Conch. Great Brit., 1st ed., 1827. *Tellimya*, Sect. ii (sp.), Brown, *op. cit.*, 2nd ed., 1844. 107; H. and A. Adams, G.R.M., ii, 478. *Mysella*, Angas, P.Z.S., 1877, 176.

Shell small, ovate or rounded quadrate, anterior end longer: hinge with a short internal subumbonal resilium and traces of an amphidetic, obsolete, external ligament; on either side of the resilium the cardinal margin bears a simple oblique lamina, the pair divaricating from the umbo and without any hook at the proximal ends; they are separated usually in one valve from the dorsal margin by a groove parallel to it, and above this groove the margin in some cases is thickened so as to form another lamina; the single laminæ of the opposite valve, sometimes represented only by inflected and bevelled extensions of the valve-margin, are received into the grooves above the laminæ of the first-mentioned valve, and the right anterior lamina is longer than the right posterior one. From Bernard's researches into the development of the hinge it is evident that these laminæ represent the secondary laminæ of such forms as the *Veneridæ* before the latter break up into cardinal and lateral teeth properly so called; but in rare instances the laminæ of the present group begin to show signs of a tendency to separate, so that the distal portions are more elevated than the medial part, and the former might be taken for laterals and the proximal ends for obscure cardinals, which in a genetic sense they really are. The ventral portion of the resilium carries a calcareous coating which in well-developed specimens is distinguishable as a lithodesma or "ossicle." (Dall.)

The type is from the Island of St. Paul.

Fossil in the Tertiary.

Key to Species.

A. Shell quadrately cuneate, with very fine sharp concentric striæ *donaciformis.*
B. Shell transversely ovate, with strong concentric riblets, reticulated by fine radiate threads .. .. .. *reniformis.*

1. Rochefortia donaciformis, Angas, 1878. Plate 54, figs. 5, *a*, *b*.

Mysella donaciformis, Angas, P.Z.S., 1878, 863, pl. 54, f. 13, Tate, T.R.S. S.Aust., ix, 99. *Rochefortia donaciformis*, Angas: Tate and May, P.L.S. N.S.W., xxvi, 433; Hedley, *op. cit.*, xxvii, 7, pl. 1, f. 10–14; Suter, T.N.Z.I., xxxix, 270.

Shell small, quadrately cuneate, moderately solid, equivalve, very inequilateral, subventricose, compressed towards the base, white, shining, finely concentrically ridged. *Beaks* inconspicuous, approximate, with a minute round prodissoconch. *Anterior end* much longer, produced, the dorsal margin slightly arcuate, descending, acutely convex towards the broadly rounded basal margin; *posterior end* short and abruptly descending, narrowly rounded below. *Sculpture* consisting of somewhat unequal sharp concentric lines. *Colour* white. *Interior* pure-white with a few greyish concentric bands. *Margins* sharp, smooth. *Hinge:* Right valve with an elevated strong oblique cardinal in front of the resilifer and a second slender one in front of the former; a faint cardinal bordering the resilifer posteriorly; on each side an elongated fine lateral, leaving a groove between them and the border of the valve; left valve with an anterior and posterior simple lamella. *Resilium* central, triangular. *Adductor-scars* distinct, the anterior larger. *Palial line* simple.

Diameter—Ant.-post., 4·8 mm.; dorso-ventral, 3·3 mm.: thickness, 2 mm.

Type in the British Museum.

Hab.—Port Pegasus, Stewart Island, in 18 fathoms; Snares and Bounty Islands, in 50 fathoms (Captain Bollons); Campbell Island (Professor Chilton). Australia and Tasmania. The type is from Aldinga Bay, South Australia.

2. Rochefortia reniformis, Suter, 1908. Plate 54, figs. 4, *a*.

Rochefortia reniformis, Suter, T.N.Z.I., xl, 1907 (1908), 357, pl. 27, f. 12.

Shell small, elongately oval, fairly solid, equivalve, inequilateral, compressed, minutely reticulated. *Beaks* small, sharply pointed, adjacent, directed backwards; prodissoconch minute, oval, smooth and shining. *Anterior end* longer, its dorsal margin slowly descending and faintly convex, anterior margin regularly rounded; *posterior end* convex, the dorsal margin straight, sloping; basal margin straight, or more often with a slight sinus in the middle *Sculpture* consisting of subequal and inequidistant strong concentric riblets, sharply rounded, with the interstices of about the same width; as they are receding from the beak they are getting much stronger and more distant; some well-marked periods of rest are usually visible at regular intervals; radial fine threads are reticulating the concentric sculpture. *Epidermis* thin, light brown. *Colour* light brown, whitish when the epidermis is lost. *Interior* white, porcellanous, the growth-periods

well marked, the margins smooth. *Hinge* with a triangular resilifer under the beaks; right valve with 2 divergent strong and elevated cardinals, the anterior with a pectinated edge; left valve with 2 dorsal narrow laminæ, the posterior of which is triangularly elevated. *Adductor-scars* fairly large. *Pallial line* simple, distant from the margin.

Diameter—Ant.-post., 7·2 mm.; dorso-ventral, 5 mm.: thickness, 3 mm.

Type in my collection.

Hab.—Hauraki Gulf, type (H. S.): Cuvier Island, in 38 fathoms (Captain Bollons); Titahi Bay, Cook Strait (Miss Mestayer); Taumaki Island, in 10 fathoms; Port Pegasus, Stewart Island, in 18 fathoms; Snares, in 50 fathoms (Captain Bollons); Dusky Sound, in 30 fathoms (R. Henry); Chatham Islands.

Genus 8. Cyamium, Philippi, 1845.

Cyamium, Philippi, Arch. f. Naturg., i, 1845, 50. Type: *C. antarcticum*, Philippi, from Patagonia. Not *Cyamium*, H. and A. Adams, 1857, nor of Jeffreys, 1863.

Shell small, thin, smooth, ovate, with an obsolete amphidetic ligament externally, and a short strong oblique internal resilium; hinge-plate narrow, with in the right valve 2 subumbonal divaricating bifid cardinals, and in the left valve 3 more slender, not obviously bifid, cardinals; laterals none in either valve; pallial line narrow, except near the posterior muscular impression, where it is irregularly wider or slightly insinuated; adductor-scars narrow, elongate; margins of the valves entire. (Dall.)

Distribution.—Antarctic.

1. Cyamium oblongum, E. A. Smith, 1898. Plate 54, figs. 6, *a*, *b*.

Cyamium oblongum, E. A. Smith, P. Mal. S., iii, 1898, 24, f. 8, 9 in text.

Shell elongate, very inequilateral, moderately convex, thin, white. *Anterior end* very short, acutely rounded, dorsal margin descending; *posterior end* long, broadly rounded, dorsal margin very little arcuate, horizontal; ventral margin lightly rounded. *Sculpture* consisting of fine incremental lines. *Colour* white, light-brownish posteriorly. *Interior* white, fulvous above, shining. *Hinge:* Right valve with 1, left valve with 2 unequal teeth. Internal *ligament* narrow, slightly oblique. *Adductor-scars:* The anterior scar moderately deep, the posterior inconspicuous.

Length, 5 mm.; height, 3 mm.; diameter, 2·5 mm.

Type in the British Museum.

Hab.—Macquarie Island (A. Hamilton).

Remark.—A good series of specimens should be re-examined.

Fam. SPHÆRIIDÆ, Dall.

Cycladidæ, Clark.

Animal having the mantle with 1 siphon or with 2 free siphons, which have simple orifices. It is hermaphrodite; the embryos are incubated in the external gill-plate.

Shell small, with a conspicuous epidermis, usually with concentric fine sculpture; valves equal, free, closed, with plain margins; area obscure or none; with a feeble short ligament, a simple pallial line, and no hinge-plate; cardinal teeth not exceeding 2 in each valve, exhibiting a cessation of development at an early stage; they are variable, very thin, often nearly parallel to the hinge-margin or defective in part of the series; laterals, anterior and posterior, usually double in the right, single in the left valve, distinctly separated from the cardinals.

These animals are fluviatile.

Upper Cretaceous to Recent.

KEY TO GENERA.

A. Anterior side of shell a little shorter than the posterior; mantle with 2 posterior siphons .. .. .. SPHÆRIUM.
B. Anterior side of shell longer than the posterior; mantle with 1 posterior anal siphon .. .. .. CORNEOCYCLAS.

Genus 1. SPHÆRIUM, Scopoli, 1777.

Sphærium, Scopoli, Intr. ad Hist. Nat., 1777, 397. Type: *Tellina cornea*, L. *Cyclas*, Bruguière, 1798. *Cornea*, Megerle, 1811. *Amesoda*, Rafinesque, 1820. *Cycladites*, Krüger, 1825. *Pisum*, Bourguignat, 1854. *Corneola*, Clessin, 1890; not of Held, 1837.

Animal with the borders of the mantle smooth; foot large, linguiform, very extensile; siphons moderately long, united at the base, separated into 2 tubes distally, not fringed; labial palps triangular, lanceolar; gills unequal, the outer ones shorter. Viviparous.

Shell small, oval, more or less inflated, subequilateral, with a thin epidermis, smooth or concentrically striated; beaks slightly inclined forwards; anterior end slightly shorter than the posterior; margins simple; 2 cardinal teeth in each valve, the anterior left and posterior right cardinals are often bifid; right valve with 2 pairs of laterals, left valve with a single anterior and posterior lateral tooth; ligament deep-set, in a groove whose upper edges nearly meet over it. Pallial line simple.

Distribution.—Europe, America, Africa, Asia, &c.; in rivers and lakes.

Fossil.—Tertiary.

Vernacular Name.—Orb-shell.

Subgen. 1. SPHÆRIUM, s. str.

Type: *S. corneum*, L.

The nepionic shell passing into the adult without any distinct demarcation; the anterior end shorter; ligament subinternal; the

2 right cardinals widely divergent and coalescent at their upper ends, apparently forming one tooth; the widening of the ventral angle causes the Λ shape to disappear; the nepionic shell finely concentrically striate or even nearly smooth and rather convex.

1. Sphærium novæ-zelandiæ, Deshayes, 1853. Plate 54, figs. 7, *a*, *b*.

Sphærium novæ-zelandiæ, Deshayes, Cat. Conch. Brit. Mus., 1853, 272; P.Z.S., 1854, 342; Conch. Icon., xx, pl. 4, f. 37; M.N.Z.M., 154; Hutton, T.N.Z.I., xiv, 149, pl. 2, f. E, *a*; Hedley and Suter, P.L.S. N.S.W. (2), vii, 664; Suter, J. de Conch., xli, 292; T.N.Z.I., xxxvii, 242, figs. in text. *S. lenticula*, Dunker, Mal. Blätter, viii, 153. Hutton, M.N.Z.M., 154. *Pisidium lenticula*, Dunker, P.L.S. N.S.W., vii, 1883, 67.

Shell small, ovato-transverse, subequilateral, the anterior end slightly shorter, but sometimes a little longer (in specimens examined alive, with 2 siphons), compressed, shining, pellucid, yellowish to light brown. *Beaks* approximate, flatly rounded. *Anterior end* with the lightly convex dorsal margin descending, acutely convex towards the broadly rounded basal margin; *posterior end* broader, rounded. *Sculpture* consisting of very fine concentric growth-lines and faint indications of radial distant striation. *Colour* yellowish-white, bluish-grey, or light brown. *Interior* bluish-white, with concentric striæ. *Margins* sharp, smooth. *Hinge:* Right valve with the 2 cardinal teeth sometimes coalescent or in a Λ-shaped position, united only at the top; left valve with an upper lamellar and lower stouter cardinal tooth. *Ligament* small, inset, but usually distinctly visible from the outside. *Pallial line* entire.

Diameter — Ant.-post., 6·8 mm.; dorso-ventral, 5·5 mm.: thickness, 3·6 mm.

Type in the British Museum.

Hab.—North Island: Lake Rotoiti, in 6 ft.; Lake Taupo, from 20 ft. to 100 ft.; Lake Waikaremoana, from 10 ft. to 20 ft. (Lucas); Lake Westmere, Wanganui (Miss Mestayer). South Island: Birch Hill Lagoon, Tasman Valley (H. S.). River Leith, Dunedin (A. Hamilton); streams near Invercargill (Professor Chilton). Chatham Islands (Professor Kirk); Auckland Islands (Professor Benham).

Genus 2. Corneocyclas, Férussac, 1818.

Corneocyclas (in part), Férussac, Dict. Sci. Nat., xii, 1818, 278. Type: *Tellina pusilla*, Gmelin. *Phymesoda*, Rafinesque, 1820. *Pisidium*, C. Pfeiffer, 1821. *Pera*, Jenyns, 1832. *Galileja*, Costa, 1839. *Euglesia* (Leach), Gray, 1840. *Cordula*, Leach, 1852. *Pisum*, Gray; not of Megerle. *Cyclas*, Blainville, 1824.

Animal having an elongate foot, which is subconic, and byssiferous in the young stages; the mantle-edges free except for the anal siphon. All the species are viviparous.

Shell small, more or less oblique, the anterior end longer than the posterior, concentrically feebly sculptured; there are no crenulations of the inner margins; lunule and escutcheon sometimes clearly

defined by a delicate line. Ligament inset. Hinge consisting of paired laterals, anterior and posterior, in the right valve, and single ones in the left valve, showing sometimes a faint striation or granulation; cardinals 2 in each valve, the posterior left and anterior right slender and entire, the two others thick, subtriangular, and bifid; in the great majority of species the 2 right cardinals remain connected and form a single sinuous or angular tooth.

The genus has a wide distribution. Found in rivers and lakes to a depth of about 150 fathoms.

Fossil.—Cretaceous and Tertiary.

Vernacular Name.—Pea-shell.

Subgen. 1. Corneocyclas, s. str.

Nepionic shell convex, concentrically striated; hinge with 2 separate cardinals in the left and a single compound, usually arcuate, cardinal in the right valve.

Key to Species.

a. Shell small, oval; length, about 3 mm.; much compressed, anterior end elongated .. .. *Hodgkini.*

b. Shell larger, oblique; length, 5–6 mm.; lightly ventricose, anterior end elongated .. .. *novæ-zelandiæ.*

c. Shell small, oval; length, 3–4 mm.; somewhat inflated, anterior end regularly convex; right valve with 2 separate cardinals .. .. *aucklandica.*

Sect. 1. Corneocyclas, s. str.

Type: *C. pusilla*, Gmel.

Nepionic valves passing into the mature disc without any strong demarcation; the anterior cardinal and lateral adjacent, and retaining traces of their original connection; ligament internal.

1. Corneocyclas Hodgkini, Suter, 1905. Plate 54, figs. 8, *a*.

Corneocyclas Hodgkini, Suter, T.N.Z.I., xxxvii, 1904 (1905), 246, f. 9 in text.

Shell very small, oval, much compressed. *Beaks* obtuse, inconspicuous; nepionic shell distinct, very finely concentrically striated, passing without change into the adult valves. *Anterior end* produced and attenuated, convex; *posterior* and *ventral margins* regularly rounded. *Sculpture* consisting of fine irregular concentric striæ. *Colour* yellowish-white. Usually with a thick ferruginous coating.

Diameter—Ant.-post., 2·75 mm.; dorso-ventral, 1·75 mm.: thickness, 0·75 mm.

Type in my collection.

Hab.—Lake Waikaremoana, in 800 ft. (type); Lake Taupo, in 280 ft. and 320 ft. (Lucas and Hodgkin).

2. Corneocyclas novæ-zelandiæ, Prime, 1862. Plate 54, figs. 9, *a*, *b*.

Pisidium novæ-zelandiæ, Prime, P.Z.S., 1862, 3; Ann. Lyc. Nat. Hist. New York, 1867, 91, fig. in text; Hutton, M.N.Z.M., 155; T.N.Z.I., xiv, 150, pl. 2, f. E, *b*. *Corneocyclas novozeelandica*, Prime: Suter, T.N.Z.I., xxxvii, 244; f. 8 in text.

Shell small, transverse, oval, oblique, very inequilateral, thin, rather compressed. *Beaks* small and obtuse, finely concentrically striated, the nepionic shell separated only by a fine ridge from the adult shell. *Anterior end* produced, elongated, and rounded; *posterior end* shorter, broadly convex; basal margin very lightly curved. *Epidermis* thin, shining. *Sculpture* consisting of fine concentric lines, which are crossed by more or less distinct, fine, microscopic radiate striæ. *Colour* yellowish-horn or greyish. *Interior* of the same colour, polished. *Margins* smooth, sharp. *Hinge:* Right valve with the 2 cardinals united, crescent-shaped; left valve with 2 cardinals, the posterior bifid, the anterior triangular. *Ligament* inset, very little of it visible from the outside.

Diameter—Ant.-post., 6 mm.; dorso-ventral, 5 mm.: thickness, 3 mm.

Type in the British Museum.

Hab.—North Island: Lake Takapuna; Western Springs and Onehunga Springs, Auckland; Lake St. John; near East Cape; Lake Waikare; Wanganui; Lake Taupo. South Island: Pelorus River; Nelson; Rivers Avon and Heathcote; creeks near Christchurch; Greymouth; Lake Manapouri; Lake Wakatipu, in 10 ft. to 30 ft.

Sect. 2. Pisidium, C. Pfeiffer, 1821.

Type: *Tellina amnica*, Müller.

The 2 right cardinals not consolidated, the larger cardinal in each valve typically bifid, the smaller one slender, entire; the laterals distant; the ligament internal.

3. Corneocyclas aucklandica, Suter, 1907. Plate 54, figs. 10, *a*–*c*.

Corneocyclas aucklandica, Suter, P. Mal. S., vii, 1907, 211, pl. 18, f. 7–7*c*.

Shell small, inequilateral, oval, and somewhat inflated. *Beaks* not prominent, rounded, situate at the posterior third; prodissoconch smooth, convex, passing without strong demarcation into the adult valve. *Anterior end* convex, dorsal margin nearly straight, slightly descending; *posterior end* much shorter, regularly rounded. Basal margin broadly convex. *Sculpture* consisting of very fine concentric striæ. *Colour* light yellow. *Interior* slightly whitish, smooth. *Hinge:* Right valve with paired anterior and posterior laterals, 2 cardinals, the anterior slender, broadly Λ-shaped, the posterior stouter, elongately triangular, situate partly below and behind the anterior cardinal; left valve with single anterior and posterior laterals, 2 cardinals, one in front of the other, the anterior tooth stouter, hook-shaped, and

the posterior very slender, directed backwards. *Ligament* small, inset. *Pallial line* simple.

Diameter — Ant.-post., 3·5 mm.; dorso-ventral, 2·75 mm.: thickness, 2 mm.

Type in my collection.

Hab.—North Island: In a pond at Parnell, Auckland, type (C. Musson); Ohaupo; Otaki Gorge (H. B. Preston). South Island: Heathcote Estuary, in slightly brackish water (H. S.).

Remark.—This species never attains the size of *C. novæ-zelandiæ*, and from young specimens of the latter it may be distinguished by being more inflated and by having the beaks more posteriorly. Most specimens have above and behind a ferruginous coating.

Fam. **UNIONIDÆ**, Fleming.

Animal with labial palpi almost always wider than long; anal opening usually separated from the superanal; embryo a glochidium, the soft parts being enclosed in a bivalve shell, and borne in the inner or outer or all four leaves of the branchiæ.

Shell nacreous, with a thick epidermis; beaks usually sculptured, often showing the remains of the nuclear shell; ligament opisthodetic; hinge with or without teeth, though with vestiges of them in every genus; when present, schizodont (heavy, amorphous, and variable teeth, often obscurely divided into subumbonal and lateral elements) and arranged as pseudo-cardinals and laterals; pallial line usually simple; prismatic border ordinarily narrow.

Genus 1. Diplodon, Spix, 1827.

Diplodon, Spix, Test. Fluv. Bras., 1827, 33, pl. 26. Type: *D. ellipticum*, Spix.

Animal with the marsupium occupying nearly the whole length of the inner branchiæ, a few ovules sometimes being found in the outer gills; branchiæ rather large, angular at base, inner much the larger, united their whole length to the abdominal sac; palpi scarcely projecting posteriorly; mantle very thin, thickened on the edges; branchial opening papillose, separated from the smooth anal opening by a strong bridge; superanal opening not closed below.

Shell elliptical, rounded, elongated or trapezoidal, with rather low beaks which are more or less distinctly radially sculptured, the ridges usually curved and approaching below, with a low or scarcely developed posterior ridge; surface slightly concentrically sculptured, sometimes broken into fine nodules or corrugations; epidermis dull, rayless; hinge with 2 compressed pseudo-cardinals in the right valve, and 1 slender lateral, and 2 compressed pseudo-cardinals in the left valve, one in front of the other, and 2 laterals; nacre bluish to white, dull, often blotched; beak cavities shallow; dorsal scars numerous, forming a row in the beak cavity parallel with the hinge-line.

Distribution.—South America, Australasia, South Africa.
Fossil from the Trias.
Vernacular Name.—Pearl-mussel.
Maori.—Kakahi.

Subgen. 1. Hyridella, Swainson, 1840.

Hyridella, Swainson, Treatise on Malac., 1840, 285. Type: *Unio australis*, Lamarck.

Animal having the embryos occupying the inner gills for the most part, which are united for their entire length to the abdominal sac; outer gills pointed below in the middle; palpi triangular; branchial opening papillose; anal opening smooth, not separated from the superanal opening.

Beaks rather low, sculpture consisting of curved, generally nodulous ridges, which approach below but usually have a smooth area of shell between them; surface sulcate or sometimes corrugated and nodulous; epidermis rayless; teeth rather delicate, compressed, often somewhat rudimentary.

Distribution.—New Guinea, Australia, Tasmania, New Zealand.

Key to Species.

A. Shell thin, umbones at about the anterior fourth of length.
  a. Shell without trace of radial sculpture, with threadlike concentric striæ, not distinctly winged posteriorly.. .. *Lessoni.*
  b. Shell with faint indications of radial sculpture, dorsal and ventral margins subparallel.. .. .. .. *lutulentus.*
  c. Shell typically winged, but some varieties have the posterior dorsal margin horizontal; with fine radiate striæ and nodules, which are sometimes prominent, V-shaped .. *Menziesi.*
B. Shell thick and solid, heavy, the umbones at the anterior fifth to seventh of length; radiate sculpture faint .. .. *Zelebori.*

1. Diplodon Lessoni, Küster, 1856. Plate 59, figs. 1, *a*.

Unio Lessoni, Küster, Conch. Cab., 1856, 135, pl. 36, f. 4. *U. depressus*, Lesson, Voy. Coq., ii, 1830, 427, pl. 15, f. 5. *U. australis*, Küster, Conch. Cab., 1861, 230, pl. 57, f. 6. *Diplodon Lessoni*, Küster: Simpson, Proc. U.S. Nat. Mus., xxii, 1900, 890; Suter, T.N.Z.I., xxxvii, 240.

Shell oblong, obliquely truncated behind, compressed, inequilateral. *Beaks* strongly eroded in all specimens I have seen. *Anterior end* short, convex; *posterior end* much longer, produced, the dorsal margin slightly sinuate behind the ligament, basal margin lightly rounded, sometimes faintly excavated at the middle. *Sculpture:* Surface with distant flatly elevated rest-marks, which, together with the intervening space, are covered with very fine threadlike concentric lines; towards the base and posterior margin the growth-lines are more distinct and slightly foliated; there is no trace of radial sculpture. *Epidermis* olive to dark brown. *Interior* bluish nacre, with yellowish patches

under the beaks, where there are several deep small dorsal scars. *Hinge:* Right valve with compressed pseudo-cardinals, the anterior upper tooth is small, grooved, the posterior tooth much larger and crenate; the lateral tooth is slightly arched and rugose posteriorly; left valve with the anterior pseudo-cardinal compressed, linguiform, slightly rugose, the posterior subtriangular, deeply denticulate; the laterals are of nearly equal height and crenate posteriorly. *Ligament* moderately long, strong. *Adductor-scars:* The anterior small, round, deep; the posterior larger, ovate, not impressed. *Pallial line* simple.

Length, 51 mm.; height, 30 mm.; diameter, 14·5 mm.

Hab.—Lake Wakatipu, in 10 ft. to 30 ft. (Lucas and Hodgkin). The type is from New South Wales.

2. **Diplodon lutulentus**, Gould, 1850. Plate 59, fig. 2.

Unio lutulentus, Gould, P. Bost. S.N.H., iii, 1850, 295; U.S. Expl. Exp., xii, 1852, 428, f. 542; Conch. Icon., xvi, 1865, pl. 25, f. 122; M.N.Z.M., 161; Hedley and Suter, P.L.S. N.S.W. (2), vii, 663; Suter, J. de Conch., xli, 291. *Diplodon lutulentus*, Gould: Simpson, Proc. U.S. Nat. Mus., xxii, 1900, 892; Index, 91.

Shell transversely elongated, scarcely falcate, dorsal and ventral margins nearly parallel, rather solid, compressed, with a moderate constriction at the ventral margin. *Beaks* at the anterior fourth, scarcely modifying the dorsal outline by their prominence, much eroded. *Anterior end* nearly as high as the posterior, regularly convex; *posterior end* rounded, the dorsal margin a little sloping; basal margin nearly straight. *Sculpture* consisting of irregular fine concentric ridges and faint indications of radiate striation. *Epidermis* shining olive-green, pale leaf-green posteriorly. *Interior:* Nacre bluish-white, with livid stains near the hinge, and a silvery brillance posteriorly. *Hinge* with a single elongated, slightly prominent, obtuse, very oblique cardinal tooth in each valve; lateral teeth slender, sharp, nearly straight, well developed, double in the left valve. The limbus, outside of the pallial impression, is much thickened. (Gould.)

Length, 51 mm.; height, 25 mm.; diameter, 10·5 mm. (type).

Animal having the foot slaty-white, edge of the mantle and gills orange; siphonal fringes black; abdominal mass bright ochreous-yellow. (Gould.)

Type in the U.S. Nat. Museum, Washington; and a *co-type* in my collection.

Hab.—New Zealand, common (Drayton). Otaua River, Hokianga; Collingwood.

Remarks.—It is not fragile, and the peculiar waves along its slope, the scattered corrugations at its disc, and its peculiar colour are its best diagnostic marks. These are usually concealed by a thick crust of black earth. It is said to come from streams in the vicinity of chalybeate springs. It varies considerably in form. (Gould.)

3. Diplodon Menziesi, Gray, 1843. Plate 59, fig. 3.

Unio Menziesi, Gray, Dieff N.Z., 1843, 257; Conch. Icon., xvi, pl. 29, f. 152; Hanley, Phot. Conch., pl. 2, f. 1; M.N.Z.M., 160; Hutton, T.N.Z.I., xiv, 148, pl. 2, f. A–C; Hedley and Suter, P.L.S. N.S.W. (2), vii, 662; Suter, J. de Conch., xli, 290. *Diplodon Menziesi*, Gray; Simpson, Proc. U.S. Nat. Mus., xxii, 1900, 892; Index, 91; Suter, T.N.Z.I., xxxvii, 234. *Unio waikarense*, Colenso, Tasm. Journ. Nat. Sci., ii, 1845, 250; T.N.Z.I., xiv, 169.

Shell oblong, high, compressed, thin, winged behind, olive-brown, concentrically ridged, and often with radial elongate nodules about the middle of the valves. *Beaks* hardly raised above the dorsal line, approximate, rounded. *Anterior end* broadly rounded, short, angled towards the straight oblique dorsal margin; *posterior end* long, higher than the anterior, winged above, obliquely truncated, produced and narrowly rounded below; basal margin lightly convex. *Sculpture* consisting of unequal, strong, concentric striæ and ridges, crossed by fine radiate striæ; young shells have the umbones ornamented with sharp, curved ridges, but this is usually lost in the later stages of growth, the beaks being much eroded; adult specimens sometimes are distinctly sculptured with elongate nodules on the lower half down to the ventral margin in the region below and behind the beaks. *Epidermis* thin, somewhat shining. *Colour* olive to olive-brown, young specimens light yellow or green. *Interior* greyish-white, slightly iridescent, olive at the umbones, sometimes this colour extends over the greater part of the valves, radiate striation more or less distinct anteriorly. *Hinge* very variable; right valve with 2 pseudo-cardinals, the inner one large, thick, ovate, rugose, the outer one a small triangularly elevated lamella, the lateral tooth a long, compressed, slightly arcuate lamella, slightly crenate and elevated posteriorly; left valve with the anterior pseudo-cardinal tooth stout, excavated behind, the posterior tooth rudimentary, the 2 lateral teeth long and slender, lightly curved, the upper one shorter, both somewhat raised and crenate behind. *Ligament* external, long and stout. *Adductor-scars* subequal, close to the ends of the hinge, the anterior scar much deeper and more rounded. *Pallial line* simple, the anterior part of the valves much thickened outside it.

Length, 77 mm.; height, 47 mm.; diameter, 22 mm.

Animal and Anatomy.—Hutton, T.N.Z.I., xiv, 149, pl. 2, f. A–D.

Type in the British Museum.

Hab.—North and South Islands, in creeks, rivers, ponds, and lakes, from shallow water to a depth of 100 ft.

Subsp. acutus, Suter, 1907. Plate 11, figs. 11, 11*a*.

Diplodon Menziesi acutus, Sut., P. Mal. S., vii, 1907, 239, pl. 22, f. 11, 12.

Distinguished from the species by the very distinctly rostrate posterior end, the nearly total absence of radial sculpture, and by being more compressed. Only young shells show traces of radially arranged nodules near the beaks. The basal margin is generally

more straight than in typical *D. Menziesi*. The beaks are much corroded in all the specimens I have seen. The shell is rather thin, yellowish-brown, with strong concentric sculpture, approaching *D. rugatus*, Hutton. The interior is nacreous olive, the hinge not different from that of the type.

Length, 70 mm. ; height, 40 mm. ; diameter, 16 mm.

Type in my collection.

Hab.—Lake Omapere (Miss Willis).

Subsp. **aucklandicus**, Gray, 1843. Plate 59, fig. 4.

Unio aucklandicus, Gray, Dieff. N.Z., 1843, 257 ; Conch. Icon., xvi, pl. 29. f. 156 ; M.N.Z.M., 161 ; Hedley and Suter, P.L.S. N.S.W. (2), vii, 662. *U. Menziesi aucklandica*, Gray : Suter, J. de Conch., xli, 290 ; T.N.Z.I., xxxvii, 234.

Distinguished from the species by the subparallel dorsal and basal margins, the greater thickness of the shell, and the posterior dorsal margin being but faintly winged ; the anterior end is regularly convex, the posterior end not very much higher than the anterior, obscurely convexly angled. Nodulous radiate sculpture is nearly always present. In the right valve the posterior pseudo-cardinal is stout, triangular, the anterior minute ; in the left valve the 2 pseudo-cardinals are both strong and corrugated.

Length, 58 mm. ; height, 31 mm. ; diameter, 17 mm.

Type in the British Museum.

Hab.—Bay of Islands, type (Dr. Sinclair) ; creeks in the vicinity of Auckland ; Henderson Creek ; Wairangi, Waikato ; Pukekohe : Lake Taupo ; Lake Waikaremoana ; Virginia Lake, Wanganui ; Waimate ; Lake Coleridge.

Remarks.—In 1905 I followed Simpson in uniting this form with the species, as almost all intermediate grades may be found. However, this can also be said to be the case with most of the other subspecies, and I think it is more in the interests of science to separate a number of more or less distinct forms which are produced by differences in their environments. Too much lumping does not tend to advance scientific knowledge. *D. aucklandicus*, as described by Gray and figured by Reeve, can always be separated from *D. Menziesi*, and intermediate forms may be assigned to one or the other, or denoted as intermediate between the two.

Fossil in the lignite-beds of Dunstan, Otago, probably older Pliocene.

Subsp. **depauperatus**, Hutton, 1883. Plate 59, fig. 5.

Unio depauperatus, Hutton, N.Z.J.S., i, 1883, 478 ; T.N.Z.I., xvi, 1883 (1884), 216 ; Hedley and Suter, P.L.S. N.S.W. (2), vii, 663. *U. mutabilis*, Lea : Suter, J. de Conch., xli, 291 ; not of Lea. *Diplodon Menziesi depauperatus*, Hutt. : Simpson, Proc. U.S. Nat. Mus., xxii, 1900, 890 : Index, 91.

Shell very thin, oblong, compressed ; beaks small, mostly eroded. *Anterior end* short, rounded ; *posterior end* slightly winged, obliquely

truncated, the dorsal margin slightly arched, descending; ventral margin straight and situated in the middle. Anterior part of valves with distinct radiate striæ. *Hinge* with the teeth not much developed; the 2 pseudo-cardinals of the right valve lamellar, low, slender, the lateral tooth a fine, long, curved lamella, raised posteriorly; left valve with 1 elongate oblique pseudo-cardinal, sometimes a second rudimentary tooth behind it; the laterals thin, curved. the upper one a little shorter.

Length, 61 mm.; height, 30 mm.; diameter, 14 mm. (type).

Type in the Dominion Museum, Wellington.

Hab.—Lake Takapuna, type (F. W. Hutton); Kaipara Heads.

Subsp. **Hochstetteri**, Dunker, 1862. Plate 59, fig. 6.

Unio Hochstetteri, Dunker, Mal. Blätt., viii, 1862, 153; Conch. Icon., xvi, pl. 86, f. 463; M.N.Z.M., 161; Hedley and Suter, P.L.S. N.S.W., (2), vii, 663. *U. Menziesi Hochstetteri*, Dunker: Suter, J. de Conch., xli, 291. *Diplodon Menziesi Hochstetteri*, Dunker: Simpson, Proc. U.S. Nat. Mus., xxii, 1900, 889; Suter, T.N.Z.I., xxxvii, 237.

Shell thickish, depressed, very inequilateral, narrow and very short in front, broadly biangular, and somewhat winged behind. The young shells are invariably typical *D. Menziesi*, but on growing larger the *posterior end* is getting roundly or biangularly truncated; the periostracum is produced in thick foliated layers, and the inner margin is considerably thickened by pearly substance, forming large rugosities, and very often pearls adhering to the shell are met with. Loose small pearls of irregular form are only exceptionally found. In my opinion the cause of this is most likely some parasite, as is the case in most of the pearl-producing bivalves. The concentric striation is rather coarse, the marks of rest distinct and elevated. *Right valve* with 2 pseudo-cardinals, the upper anterior forming a small lamella, the posterior being strong, compressed, high, triangular, and slightly corrugated; the single lateral tooth slightly curved, its posterior end usually abruptly descending. *Left valve* with 2 pseudo-cardinals arising from a common base, both blunt, the anterior larger; the 2 laterals curved, the lower one denticulated posteriorly, gradually descending.

Length, 65 mm.; height, 48 mm.; diameter, 23 mm.

Type in the K.K. Hofmuseum, Vienna.

Hab.—River Waikato, type (Hochstetter); Lakes Rotorua, Rotoiti, and Taupo, to a depth of 30 ft.; Kopuaranga River · Cheviot; River Avon.

Subsp. **Lucasi**, Suter, 1905. Plate 59, fig. 7.

Diplodon Menziesi Lucasi, Suter, T.N.Z.I., xxxvii, 1904 (1905), 239, f. 2, 3 in text.

Shell oblong-ovate, very much compressed, thin and fragile. *Beaks* low, eroded. *Anterior end* short, angularly rounded; *posterior end* produced, obliquely truncated; dorsal and ventral margins slightly diverging, both straight, the latter slightly sinuate. *Surface*

with strongly pronounced rest-marks, and between them a few lines of growth, all close together and foliated at the anterior end; in adult specimens the middle part has distinct radiate nodulous sculpture, partly ∧-shaped. *Epidermis* olive-green, waxy, but nearly the whole surface is covered with a thin ferruginous coating. *Interior* bluish-white, pearly, a little blotched with olive in the umbonal cavity, where there are rather large and deep dorsal scars. *Hinge:* Right valve with 2 compressed small pseudo-cardinals, the upper anterior tooth is a small smooth lamella, the lower tooth is more elevated, conoidal, and strongly crenate; the lateral tooth is almost straight, thin and rugose at its posterior portion. In the left valve there is a rather long compressed lower anterior rugose pseudo-cardinal, the upper tooth is quite rudimentary; the upper lateral tooth is a little higher and more rugose behind than the other. *Ligament* small, not much raised. *Adductor-scars* not deep.

Length, 45 mm.; height, 24 mm.; diameter, 8 mm.

Type in my collection.

Hab.—Lake Manapouri, in 60 ft., type (Lucas and Hodgkin).

Subsp. rugatus, Hutton, 1883. Plate 59, fig. 8.

Unio rugatus, Hutton, N.Z.J.S., i, 1883, 478; T.N.Z.I., xvi, 216; Hedley and Suter, P.L.S. N.S.W. (2), vii, 663. *U. Menziesi rugata*, Hutt.: Suter, J. de Conch., xli, 291. *Diplodon Menziesi rugatus*, Hutt.: Simpson, Proc. U.S. Nat. Mus., xxii, 1900, 889; Suter, T.N.Z.I., xxxvii, 238.

Shell oval, rather thin, anterior end compressed, rounded, finely striated; posterior subventricose, very rudely concentrically corrugated; dorsal margin ascending, straight; ventral margin flatly rounded; cardinal teeth rugose, not striated. (Hutton.)

Right valve with the anterior pseudo-cardinal oblique, very small, the posterior tooth strong, compressed, pectinated, the lateral tooth corrugated at its posterior end; *left valve* with 2 stout compressed pseudo-cardinals, which are subequal and also pectinated, the 2 laterals distally corrugated. Anterior adductor-scar much impressed. *Margins* much thickened posteriorly outside the simple pallial line.

Length, 52 mm.; height, 34 mm.; diameter, 17 mm. (type).

Type in the Canterbury Museum, Christchurch.

Hab.—South Island: Lake Pearson (type); Upper Waimakariri River; Lake Letitia, Mount White; Cheviot; Lake Kanieri; Wairau River; Owaka Stream, Clutha. North Island: Lake Waikare; Kopuaranga River.

Subsp. Websteri, Simpson, 1902. Plate 59, fig. 9.

Diplodon Websteri, Simpson, "The Nautilus," xvi, July, 1902, 30; Suter, T.N.Z.I., xxxvii, 236. *Unio* (*Diplodon*) *Websteri*, Simps.: Webster, T.N.Z.I., xxxviii, 311, pl. 39, f. 5. *D. Websteri*, Simps.: Suter, T.N.Z.I., xxxix, 270; Dall, Proc. U.S. Nat. Mus., xxxv, 1908, 181, pl. 30, f. 1, 2. Not *Unio Websteri*, Wright, 1888.

Shell long, rhomboid, compressed or subcompressed, inequilateral. *Beaks* subcompressed, pointed, their sculpture apparently a few

lachrymose nodules arranged in a somewhat radial pattern. *Surface* with uneven growth-lines and impressed rest-marks, sculptured throughout with lachrymose nodules, which are often V-shaped, those along the upper part of the low posterior ridge slightly knobbed. *Epidermis* dark olive-green, clouded with lighter green, rather dull. *Pseudo-cardinals* small, subcompressed, granulose, 2 in each valve. *Laterals* straight, 2 in the left valve, 1 in the right. *Muscle-scars* small, shallow, and irregular. *Nacre* bluish, lurid purple near and in the beak cavities, thicker in front. (Simpson.)

Length, 67 mm.; height, 32 mm.; diameter, 14 mm. Length, 62 mm.; height, 32 mm.; diameter, 17 mm.

Type in the U.S. Nat. Museum, Washington.

Hab.—Waiuku; creeks near Pukekohe and Henderson.

Remarks.—Apparently allied to *D. novæ-hollandiæ*, Gray, of Australia, but smaller, less inflated, and less solid than that species. In *D. novæ-hollandiæ* the anterior third of the shell is almost destitute of nodules; in the present species the whole surface is covered with them. (Simpson.)

This subspecies is nearest to *D. aucklandicus*, Gray, from which it is distinguished by the parallel dorsal and basal margins and the much more prominent nodulous sculpture. The development of the latter, however, is very variable, being sometimes limited to the median part of the valves. It is always found together with *D. aucklandicus*.

4. Diplodon Zelebori, Dunker, 1866. Plate 59, fig. 10.

Unio Zelebori, Dunker: Frauenfeld, V.Z.B.G. Wien, xvi, 1865 (1866), 915; Reise "Novara," Zool., ii, 1867, 15, pl. 2, f. 28; M.N.Z.M., 161: Hedley and Suter, P.L.S. N.S.W., (2), vii, 662; Suter, J. de Conch., xli, 292. *Diplodon Zelebori*, Dunker: Simpson, Proc. U.S. Nat. Mus., xxii, 1900, 890.

Shell oval-oblong, very solid, subventricose, rather compressed towards the base, with a short vertical ridge descending from the anterior part of the beaks, and a much longer oblique ridge extending from the posterior end of the beaks towards the lower part of the posterior end. *Beaks* swollen, turned forward, with an anterior and posterior angle, concentrically finely ridged, and very often ornamented with fine zigzag wrinkles; they are approximate and situated at about the anterior fifth to seventh of the length. *Anterior end* short, convex, the dorsal margin excavated in front of the umbones: *posterior end* linguiform, the dorsal margin convex, descending, acutely convex toward the straight subsinuate basal margin. *Sculpture* consisting of fine concentric striæ with well-marked, rather regularly spaced rest-marks; faint radiate striæ and nodules are sometimes present. *Epidermis* more or less shining, thin, pale olive, yellowish-brown to blackish-brown. *Interior* iridescent under the umbones and around the dorsal and posterior margins, bluish-white, the nacre

very thick on the anterior lower part of the valves; the callosity below the pseudo-cardinals transversely finely wave-striated; an oblique straight ridge runs from the umbonal cavity to the lower part of the posterior adductor-scar. *Hinge:* Right valve with 2 compressed, crenated pseudo-cardinals, the anterior tooth smaller, and 1 long, substraight, posteriorly raised and finely corrugated lateral tooth; left valve with 2 crenated subequal pseudo-cardinals, and 2 long laterals, the upper one shorter and smaller than the lower. *Ligament* long, strong. *Adductor-scars:* There are 2 in front, a deep roundish one with a straight upper edge below the pseudo-cardinals, and a faintly impressed small one behind it; posterior scar not impressed, large, oval. *Pallial line* simple, very distinct, the basal margin much thickened outside it on the anterior two-thirds.

Length, 50 mm.; ratio of length, height, and diameter, 100, 52, 32 respectively. An average form selected from about 100 specimens shows the following dimensions: Length, 86 mm.; height, 48 mm.; diameter, 25 mm.

This shell has twenty-two rest-marks.

Type in the K.K. Hofmuseum, Vienna.

Hab. — New Zealand ("Novara" Exped.); River Wairarapa (Captain Hutton); near Napier (Colenso), two specimens in the Dominion Museum; Papuni district, between Maungapohatu and Poverty Bay (Elsdon Best); Albury Creek and Ashburton River (W. W. Smith).

Remarks.—In Dunker's diagnosis the shell is said to be "tenuicula," but it is the most solid New Zealand species. Dunker mentions that it has some analogies with *Unio pictorum*, L., a common European shell, which is decidedly a species with thick valves.

Suborder 3. TELLINACEA.

Eulamellibranchia in which the mantle is not extensively closed, with 2 pallial sutures and 2 well-developed siphons; the gills smooth. The foot is compressed and elongated. The labial palps very large. Dimyarian. Shell with the pallial line sinuate; ligament external, seated on nymphs; hinge normally with an anterior and posterior lateral in each valve; 2 radial cardinals, of which the anterior is commonly bifid and somewhat pedunculated, and the posterior, as well as the laterals, often obsolete.

Fam. **TELLINIDÆ**, Deshayes.

Animal having the mantle widely open in front, the edges papillate; foot large, laterally compressed, with a byssogenous posterior apparatus, but not byssiferous; the siphons separate and elongated; palps very large, triangular; gills united behind, the external branchial plate directed upwards.

Shell-substance cellulo-crystalline, with an inconspicuous epidermis; valves slightly inequal, free, rounded in front, more or less rostrate, oblique and gaping behind, compressed, usually with smooth margins, low beaks, and variable (chiefly concentric) sculpture; anterior adductor-scar larger, frequently irregular; pedal distinct; resilium embraced in the ligament, subexternal; area narrow, small, covered with a dark epidermis, or frequently obsolete; hinge-plate narrow, anterior laterals approximate, posterior more distant from the cardinals, when present; cardinal teeth small; pallial sinus deep, discrepant in the opposite valves.

Jura to Recent.

KEY TO GENERA.

A. Each valve with 2 cardinal teeth and 2 laterals, the latter most distinct in the right valve .. .. TELLINA.
B. Both valves with 2 cardinal teeth, left valve very often with the posterior cardinal obsolete; no lateral teeth .. .. MACOMA

Genus 1. TELLINA (Linné), Lamarck, 1799.

Tellina, L., Syst. Nat., ed. 10, 1758, 674; Lamarck, Prodrome, 1799, 84.
Type: *Tellina virgata*, L.

Animal ovate, compressed, mantle entirely open in front, its margin fimbriated; siphons long, separate throughout, usually nearly equal, their orifices plain, or very indistinctly toothed. Foot large, triangular, compressed, apiculate. Labial palpi large, lanceolate.

Shell subequivalve, rather compressed, suborbicular or transversely elongated, obliquely flexed behind; beaks subcentral; hinge with 2 cardinals and generally 2 laterals in each valve, 1 lateral anterior and 1 posterior, the laterals most distinct in the right valve; pallial sinus wide and deep; ligament external, prominent.

Distribution.—World-wide; over 400 species are known.

Fossil in the Cretaceous and Tertiary.

The molluscs of this genus live in sand or sandy mud, buried beneath the surface; the majority at low-water mark or in considerable depth. A few species have a range from the coralline zone to about 450 fathoms.

KEY TO SUBGENERA.

A. With 2 lateral laminæ in each valve, those in the left valve always less strong .. .. TELLINA, s. str.
B. With 2 lateral laminæ in the right valve, one or both of those of the left valve absent or obsolete; sinus free .. ARCOPAGIA.
C. Hinge with a strong right anterior lateral, closely adjacent to the cardinals, the left laterals absent, the posterior right lateral obsolete, with internal thickened radii .. ANGULUS.

Subgen. 1. TELLINA, s. str.

Type: *T. virgata*, L. *Angulus*, Megerle, 1811. *Tellinella*, "Gray," Mörch, 1852. *Eutellina*, Fischer, 1887.

Valves sculptured externally, the concentric sculpture stronger; somewhat compressed, ovate-trigonal, subequivalve, with a more or

less distinct ridge from the beaks towards the lower posterior angle ; subequilateral, porcellanous, often elegantly coloured, the periostracum hardly visible ; the umbonal radii internally inconspicuous or absent, the shell-margin entire, the siphonal sinus more or less coalescent below with the pallial line. (Dall.)

Inhabiting warmer seas.

Key to Species.

A. Shell with sharp concentric riblets .. .. *eugonia.*
B. Shell with fine concentric lines.
a. Adult shell large, solid, beaks slightly anterior or at the middle *deltoidalis.*
aa. Adult shell small and thin.
b. Anterior end longer.
c. Shell shortly truncated behind, white .. .. *Charlottæ.*
cc. Shell wedge-shaped posteriorly, pinkish or yellowish *Huttoni.*
bb. Anterior end shorter, both ends convex .. .. *urinatoria.*

1. Tellina Charlottæ, E. A. Smith, 1885. Plate 54, figs. 11, *a*, *b*.

Tellina (*Tellinella*) *Charlottæ*, E. A. Smith, Chall. Rep., xiii, 1885, 100, pl. 4, f. 1 ; Index, 91.

Shell small, thin, compressed, very inequilateral, white ; surface not highly glossy, with a silky, faintly iridescent appearance ; transversely elongated, sharply rounded in front, and shortly wedge-shaped behind, terminating in a short truncation. *Anterior end* considerably longer than the posterior, the dorsal slope slightly excurved, descending only a little ; *posterior end* with the dorsal margin shorter, very straight and very oblique ; the lower outline slightly arcuate, and very feebly sinuated posteriorly. *Sculpture* consisting of numerous concentric threadlike liræ, which become gradually thicker as the shell increases. They do not extend quite to the hinder margin, but stop short at a slight fold radiating from the beaks to the lower hindmost extremity. Some of them, however, do reach the margin, and these are elevated into short lamellæ, those on the right valve being a little flexuous. *Colour* white, with the exception of a very faint tinge of yellow towards the beaks. *Interior* glossy, radiately substriated, with a yellow stain towards the umbones. *Hinge :* There are 2 cardinal teeth in the right valve and 1 in the left, that in the latter, and the posterior in the former, being somewhat cleft at the top ; the lateral teeth are slender, elongate, the anterior being rather nearer the beaks than the posterior. *Pallial sinus* large and deep, extending almost to the front muscular impression.

Length, 14 mm. ; height, 8·5 mm. ; diameter, 3·5 mm.

Type in the British Museum.

Hab.—Queen Charlotte Sound, in 10 fathoms ; "Challenger" Station 167A.

I have not seen this species.

2. Tellina deltoidalis, Lamarck, 1818. Plate 59, fig. 11.

Tellina deltoidalis, Lamarck, A.s.V., v, 1818, 532; Delessert, Recueil de Coq., 1841, No. 49, pl. 6, f. 7; Hanley, Cat. Rec. Biv. Shells, 70, 347, pl. 13, f. 3; Conch. Icon., xvii, 1866, pl. 7, f. 29; Römer, Conch. Cab., x, 1871, 54, pl. 15, f. 4–7; C.M.M., 67; M.N.Z.M., 143. *T. lactea*, Quoy and Gaimard, Voy. Astrol., iii, 1835, 501, pl. 81, f. 14–16; Crit. List, 42; Index, 91.

Shell moderately large, fairly solid, ovate, yellowish-white, inequilateral, strongly folded behind, the right valve slightly more convex than the left. *Beaks* in front of the middle, contiguous, not raised, broadly convex. *Anterior end* mostly shorter, convex, the dorsal margin long, convex, slowly descending. *Posterior end* produced, subangular, the dorsal margin long, straight or slightly concave, descending, both valves folded and turned to the right; basal margin broadly rounded, a little sinuate at the middle. *Sculpture* consisting of fine concentric striæ, obsolete on the upper half of the valves, and very faint close radiate striæ. *Epidermis* very thin, horny, persistent only near the margins. *Colour* white or yellowish-white, usually of a deeper yellow towards the umbones. *Interior* white, sometimes stained with yellow or orange, porcellanous, radiately striated, distinctly so at the basal margin, and with 3 distinct posterior radial ribs, crossing the muscle-scar. *Hinge:* Right valve with 2 cardinals, the posterior stouter and bifid, 1 rather large triangular lateral near the cardinal, and 1 small posterior lateral distant from the cardinal; left valve with 2 narrow cardinals, and almost obsolete anterior and posterior laterals. *Ligament* rather short, strong, inserted on well-developed nymphs. *Adductor-scars* unequal, the anterior very high and narrow, the anterior irregularly rounded and smaller. *Pallial sinus* linguiform, extending to the anterior muscle-scar.

Length, 36·5 mm.; height, 30 mm.; diameter, 12 mm. (type). Length, 41 mm.; height, 33 mm.; diameter, 14·5 mm. (*T. lactea*, Q. & G.). Length, 73 mm.; height, 53 mm.; diameter, 22 mm. (Auckland specimen). Length, 46 mm.; height, 33 mm.; diameter, 13 mm. (Victoria specimen).

Type in the Mus. Hist. Nat., Geneva.

Hab.—North and South Islands: Bay of Islands, Hauraki Gulf; Wellington Harbour; Akaroa Harbour, in 6 fathoms (H. S.); Dunedin Harbour. Kermadec Islands (Captain Bollons). Also Australia and Tasmania.

Remarks.—The variations of this species in form are very considerable, as already pointed out by Dr. E. Römer. The typical form is rather small, and the beaks at the middle of the length. Usually, however, the anterior end is slightly shorter than the posterior. *T. lactea*, Q. & G., is a more solid, highly triangularly ovate form, with the beaks at the middle of the length and the hind dorsal slope distinctly excavated. Specimens which exactly agree with the figures in the Voy. Astrol. occur in Dunedin Harbour in stiff mud.

In Auckland and Wellington Harbours *T. deltoidalis* attains a much larger size than in Australia or Tasmania, as is evidenced by the measurements given. I have compared New Zealand and Australian specimens of the same size, and could not find the slightest difference between the two.

Maori.—Kaikaikaroro (*teste* Captain Bollons).

3. Tellina eugonia, nom. nov. Plate 59, fig. 12.

Tellina angulata, Hutton, T.N.Z.I., xvii, 1884 (1885), 322; Plioc. M., 80, pl. 9, f. 86; Suter, T.N.Z.I., xxxviii, 318; not of Gmelin.

Shell ovato-trigonal, transverse, compressed, inequilateral, anterior end longer, regularly concentrically ribbed. *Beaks* not much raised, contiguous, sharply pointed, incurved. *Anterior end* somewhat longer, regularly rounded, the dorsal margin lightly convex and very slowly descending. *Posterior end* attenuate, shortly truncated, the dorsal margin straight or lightly excavated, basal margin broadly rounded, ascending posteriorly. *Sculpture* consisting of equidistant, close, obliquely raised, sharp concentric ribs, the interstices with fine microscopic radiate striæ; right valve with a posterior fold, left valve with 2 posterior folds, separated by a broad groove; at these folds the ribs are partly getting obsolete and the remaining ones are somewhat lamellate. *Colour* yellowish-horn. *Interior* white, shining, radially faintly striated, and showing to some extent the sculpture of the outside. *Hinge:* Right valve with two cardinals, the posterior bifid, and 2 laterals, the anterior nearer the cardinal than the posterior; left valve with 2 cardinals, the anterior bifid, the posterior very small, and 2 laterals. *Ligament* rather short. *Adductor-scars* unequal, the anterior high, the posterior smaller, rounded. *Pallial sinus* large, extending to within close proximity of the anterior scar.

Length, 33 mm.; height, 22 mm.; diameter, 9 mm. (type).

Type, from the Pliocene, in the Canterbury Museum, Christchurch.

Hab.—Channel Island, Hauraki Gulf, in 25 fathoms; Titahi Bay, Cook Strait (Miss Mestayer); off Otago Heads; Stewart Island, in 15 fathoms (A. Hamilton).

Fossil in the Pliocene.

4. Tellina Huttoni, E. A. Smith, 1885. Plate 54, figs. 12, *a*, *b*.

Tellina (*Tellinella*) *Huttoni*, E. A. Smith, Chall. Rep., xiii, 1885, 101, pl. 4, f. 2.

Shell small, thin, compressed, translucent, very inequilateral, oblong, rounded in front, wedge-shaped behind, shining, closely concentrically striated, yellowish or pinkish. *Beaks* acute, white, situated at the posterior third of length. *Anterior end* convex, the dorsal margin long, but little descending, nearly straight. *Posterior end* shorter, oblique, narrowly convex, the dorsal slope straight, basal margin lightly rounded, convexly ascending in front, faintly sinuated behind. *Sculpture* consisting of very fine concentric striæ, the beaks

smooth; at the posterior dorsal part the striæ are sharply raised; a few faint radiate striæ are visible on the posterior end, the left valve having also an obsolete fold. *Colour* pinkish or yellowish. *Interior* of the same colour, polished, with microscopic radial striæ. *Hinge:* 2 cardinal teeth in each valve, the right posterior and left anterior stout, triangular, and slightly cleft at the top; lateral teeth more distinct in the right valve, the anterior teeth near the cardinals, the posteriors remote. *Ligament* short, stout. *Adductor-scars* unequal, the anterior oval, high, the posterior irregularly rounded. *Pallial sinus* deep, reaching nearly to the anterior muscular scar.

Length, 10 mm.; height, 5·3 mm.; diameter, 2 mm.

Type in the British Museum.

Hab.—Queen Charlotte Sound, Cook Strait, in 10 fathoms; "Challenger" Station 167A; Lyttelton Harbour, in 2–4 fathoms (H. S.).

Var. sterrha, n.v.

Tellina ticaonica, Deshayes: Hutton, C.M.M., 67; M.N.Z.M., 144; not of Deshayes.

Distinguished from the species by the following characters: The shell is larger, much more solid, the valves, especially the left, more convex, opaque, the surface very distinctly iridescent, the posterior end is flexed to the right; the colour is more intense, mostly pink; interior porcellanous, pink or flesh-colour, whitish at the margin.

Length, 14 mm.; height, 10 mm.; diameter, 4 mm.

Type in my collection.

Hab.—Lyttelton Harbour, in 2–4 fathoms, type (H. S.); Wet Jacket Arm, in 12 fathoms (Captain Bollons); Stewart Island, in 15 fathoms (A. Hamilton).

5. Tellina urinatoria, n. sp. Plate 54, fig. 13.

Shell small, thin, compressed, transversely oval, very inequilateral, white, convex at both ends. *Beaks* at about the anterior third of length, acute, slightly raised, and directed forwards. *Anterior end* short, convex, the dorsal margin oblique, slightly rounded. *Posterior end* produced, rounded, the dorsal margin straight, very slowly descending; basal margin broadly convex, slightly ascending anteriorly. *Sculpture* consisting of very fine and close concentric lines, crossed by microscopic radiate striæ. *Colour* white. *Interior* polished, white, smooth. *Hinge:* 2 cardinal teeth in each valve, the anterior left and posterior right stouter, triangular, cleft at the top; 2 laterals in each valve, the anterior teeth nearer the cardinals. *Adductor-scars* unequal. *Pallial sinus* large, reaching the anterior adductor-scar.

Length, 7·5 mm.; height, 5 mm.; diameter, 2·3 mm.

Type in the Canterbury Museum, Christchurch.

Hab.—Twenty-four miles south-east of Long Point, in 120 fathoms (E. R. Waite).

Subgen. 2. Arcopagia (Leach), Brown, 1827.

Arcopagia (Leach), in Brown, Ill. Conch. Gt. Brit., 1827, p. ii, pl. 16, f. 8. *Cydippe*, Leach, 1852. Type: *Tellina crassa*, Pennant.

Shell large, solid, rounded, moderately convex, the flexure obsolete; posterior left lateral absent and the anterior obsolete, other teeth normal; sinus free, ascending obliquely; internal radii thick and strong but ill-defined; sculpture concentric, usually smoothish or not sharply lamellate, sometimes reduced to incremental lines.

Warm, temperate, and tropical seas.

The chief feature of this group is the free sinus, but this in species otherwise closely allied becomes more or less confluent. (Dall.)

6. Tellina disculus, Deshayes, 1855. Plate 59, fig. 13.

Tellina disculus, Desh., P.Z.S., 1854 (1855), 360; Conch. Icon., xvii, 1866, f. 306; Römer, Conch. Cab., x, 1871, 79, pl. 22, f. 4–6; Crit. List., 42; M.N.Z.M., 143; Hutton, P.L.S. N.S.W., ix, 521. *T. lactea*, Q. & G.: Gray, Dieff. N.Z., 254; not of Quoy and Gaimard. *T. sublenticularis*, Sowerby: Hutton, C.M.M., 67; J. de Conch., xxvi, 47; not of Sowerby.

Shell suborbicular, rather thick, strongly concentrically striated, yellowish-white, the right valve more convex than the left. *Beaks* not much produced, situate a little behind the middle, slightly inclined towards the ligament. *Anterior end* regularly rounded, semicircular, the dorsal margin descending, nearly straight; *posterior end* shorter, very obtusely subangular, with a shallow groove on the left valve and round ridge on the right, the dorsal slope straight, descending; basal margin broadly rounded. *Sculpture* consisting of strong, sharp, equidistant and close concentric striæ, with traces of radiate lines. *Colour* dirty-white, yellow at the beaks. *Interior* yellowish in the middle and umbonal cavity, white at the margins, smooth, shining, the radii not well pronounced. *Hinge:* Right valve with 2 divergent cardinals, the posterior stronger, 1 triangular anterior lateral tooth a short distance in front of the cardinal and a more distant triangular posterior lateral; left valve with 2 not very high cardinals, the anterior much stouter, the posterior an oblique thin lamella, the lateral teeth obsolete. *Ligament* elongate, strong, raised. *Adductor-scars* subequal, high and oval, the anterior a little larger. *Pallial sinus* large, triangular, reaching in front to within a short distance of the muscle-scar, the lower part almost confluent with the pallial line.

Length, 38 mm.; height, 38 mm. (type). Length, 37 mm.; height, 33 mm.

Type in the British Museum.

Hab.—North Island; Banks Peninsula; Chatham Islands.

Fossil in the Pliocene.

Subgen. 3. Angulus, Megerle (em.), 1811.

Angulus, Megerle von Mühlfeldt, Mag. Gesellsch. Naturforsch. Freunde, Berlin, 1811, 47. Type: *Tellina lanceolata*, L. *Faberlina*, Gray, 1851. *Tellinula*, Auct.

Shell elongated, mostly small, compressed, with the posterior end angularly pointed and not twisted, the surface smooth or with fine concentric sculpture; nymphs short and prominent, the ligament short; hinge with a single adjacent lateral well developed in the right valve anteriorly; internally a thickened ray passes from the umbo just behind the anterior adductor-scar and 1 or 2 narrower similar rays in front of the posterior adductor, often stronger in the left valve, the posterior rays sometimes obsolete; sinus largely or wholly coalescent with the pallial line below. (Dall.)

Eocene to Recent.

Key to Species.

A. Anterior end shorter, posterior end produced, subangular . . *alba.*
B. Beaks at or very near the middle.
a. Posterior end angled, trigonal; ratio of height to length, 1 : 1·6 *glabrella.*
aa. Posterior end distinctly rostrate; ratio of height to length, 1 : 1·8 . . . . . *Spenceri.*

7. Tellina alba, Quoy and Gaimard, 1835. Plate 59, fig. 14.

Tellina alba, Q. & G., Voy. Astrol., iii, 1835, 500, pl. 80, f. 1–3; Dieff. N.Z., 254; Hanley, in Thes. Conch., i, 1846, 311, pl. 62, f. 193; Conch. Icon., xii, 1866, f. 180; Römer, Conch. Cab., x, 1871, 255, pl. 48, f. 10–12; Crit. List, 42; M.N.Z.M., 143. *T. albinella*, Lamarck: Hutton, C.M.M., 66; not of Lamarck.

Shell ovato-subtrigonal, rather thin, subpellucid, inequilateral. anterior end shorter, compressed, white, concentrically striated, slightly gaping behind. *Beaks* contiguous, somewhat raised, acute, directed slightly backwards. *Anterior end* rounded and obsoletely plicated above, the dorsal margin lightly convex and slowly descending; *posterior end* produced, subangular, distinctly folded, the dorsal margin convex, more rapidly descending than the anterior slope; basal margin broadly and regularly rounded. *Sculpture* consisting of very fine and dense concentric lines, which are getting much stronger on the posterior dorsal slope; there are 3 to 4 obsolete radial anterior ridges and 2 folds near the posterior dorsal margin. *Epidermis* very thin, somewhat iridescent. *Colour* pure-white. *Interior* bluish-white, shining, with distinct anterior and posterior rays. *Hinge:* Right valve with 2 oblique cardinals, the posterior bifid, 1 slightly raised anterior lateral close to the cardinal; left valve with 2 cardinals, the anterior bifid. *Ligament* short, deep-set, the nymphs well developed. *Adductor-scars* unequal, the anterior high and narrow, the posterior smaller, subquadrangular. *Pallial sinus* deep, triangular, broadly rounded in front, where it nearly reaches the muscle-scar.

Length, 58 mm.; height, 38 mm.; diameter, 9 mm.

Type in the Mus. Hist. Nat., Paris.

Hab.—North and South Islands, in 5 to 10 fathoms, sandy bottom.
Maori.—Hohe-hohe (*teste* Hutton).
Fossil in the Miocene and Pliocene.

8. Tellina glabrella, Deshayes, 1855. Plate 59, fig. 15.

Tellina glabrella, Desh., P.Z.S., 1854 (1855), 366; Conch. Icon., xvii, 1866. f. 296; Crit. List, 42; Ereb. & Ter., 5, pl. 2, f. 7; Hutton, J. de Conch., xxvi, 47; M.N.Z.M., 144; P.L.S. N.S.W., ix, 520.

Shell ovato-trigonal, transverse, thin, subequilateral, yellowish-white, compressed, obsoletely concentrically striated. *Beaks* at the middle, acute, not much raised. *Anterior end* semielliptical, convex above and below; *posterior end* attenuated, trigonal, above straight or slightly concave, declining, distinctly angled on meeting the basal margin, which is straight in the middle, arched at the ends. *Sculpture* consisting of very fine, dense, unequal concentric lines, and faint but under a lens distinctly visible radial striæ; obsolete folds on the posterior part of the valves, where a number of the concentric lines are sharply raised. *Epidermis* thin, horny, slightly iridescent. *Colour* yellowish-white, with concentric bands of whitish, umbones light orange. *Interior* yellow, the margins white, shining, with a distinct anterior and several posterior radiate rays. *Hinge:* Right valve with 2 cardinals, the posterior bifid, 1 distinct lateral at some distance from the anterior cardinal and 1 smaller lateral behind the nymph; left valve with 2 cardinals and an obsolete anterior lateral, more distinct in adult specimens. *Ligament* moderately long, strong, nymphs prominent. *Adductor-scars* unequal, the anterior high and narrow, the posterior smaller, subquadrate. *Pallial* sinus large, linguiform, gibbous above, narrowly rounded in front, and nearly reaching the anterior scar.

Length, 29 mm.; height, 17 mm.; diameter, 6 mm. (type). Length, 50 mm.; height, 31 mm.; diameter, 11 mm.

Type in the British Museum.
Hab.—North and South Islands, in 4 to 10 fathoms.
Fossil in the Pliocene.

9. Tellina Spenceri, Suter, 1907. Plate 59, fig. 16.

Tellina (*Angulus*) *Spenceri*, Suter, P. Mal. S., vii, 1907, 212, pl. 18, f. 9.

Shell elongately oval, thin, compressed, rostrate and but slightly flexuous posteriorly, subequilateral, with fine concentric striæ, white. *Beaks* small, approximate, sharply pointed, smooth and shining, a little anterior or median. *Anterior end* regularly rounded, nearly straight dorsally, with a slight fold from the beaks to a little above the middle. *Posterior end* rostrate, with a distinctly raised fold from the beaks towards the posterior angle, slightly flexed to the right; the dorsal margin excavate below the ligament, descending straight to the rostrum, and slightly sinuate below it; basal margin broadly

rounded, somewhat straightened in the middle. *Sculpture* consisting of close and fine concentric striæ with distinct periods of rest; the striæ are more distinct and slightly raised on both ends, inconspicuous in the centre; very faint and distant radiate lines are visible under a good lens. *Epidermis* very thin, yellowish, easily rubbed off. *Colour* yellowish-white, darker on and above the posterior fold. *Interior* white, porcellanous; margins smooth. *Hinge:* Right valve with a central triangular and bifid cardinal, a second, smaller and oblique, in front of it; close and parallel to it is a distinct lateral tooth; a trace of a posterior lateral is mostly present, situate behind the nympha, the latter being rather short; left valve with a posterior, thin and very oblique, and a central, trigonal, bifid cardinal. *Ligament* rather short and high. Anterior *adductor-scars* oval, posterior scars almost round and larger. *Pallial sinus* large, broadly triangular, the highest point near the middle of the antero-posterior axis, thence descending to within a short distance of the anterior adductor-scar; the ventral part coalescent with the pallial line. A radial ray passes from the beaks towards the margin behind the anterior adductor-scar, and 2 posteriorly, all of which, however, are not very conspicuous.

Length, 45 mm.; height, 25 mm.; diameter, 10 mm.

Type in my collection.

Hab.—North and South Islands: Opotiki, type (C. Spencer); Hicks Bay (Captain Bollons); New Brighton and Akaroa Harbour, in 6 fathoms (H. S.).

Genus 2. Macoma, Leach, 1819.

Macoma, Leach, App. ii, Ross's Voy., p. lxii, 1819. Type: *Macoma tenera*, Leach (= *Tellina calcarea*, Gmelin). *Limicola*, Leach, 1852; not of Koch, 1816. *Macalia*, H. Adams, 1860. *Tellinungula*, Römer, 1872. *Capsa*, Tryon, 1869. *Psammobia* (sp.), Turton, 1822. *Psammotea*, Gray, 1847; not of Turton, 1822. *Sanguinolaria* (sp.), Conrad, 1831. *Rexithærus*, Conrad, 1869.

Animal having the siphons naked, the anal siphon long, the branchial siphon very short.

Shell subtrigonal, the periostracum conspicuous, with a marked posterior flexure, usually colourless, or, if coloured, without a colour pattern; hinge without lateral teeth; right valve with 2 convergent cardinals, the posterior larger and cleft; left valve with an anterior larger slightly cleft cardinal, and on the nympha a smaller cardinal, which sometimes becomes obsolete; in adult shells one or the other of these teeth, or all, disappear. The pallial sinus coalescent with the pallial line below, and often discrepant in the two valves.

Distribution.—All seas. Typical forms inhabit mostly the cooler seas, and especially boreal waters; in the laminarian and coralline zone.

Fossil in the Tertiary.

Sect. 1. Psammotreta, Dall, 1900.

Psammotreta, Dall, Trans. Wagn. Free Inst., iii, pt. 5, 1900, 1045. Type: *Macoma aurora*, Hanley.

Shell with the resilium internal, shorter than and partly separated from the ligament.

1. Macoma Suteri, E. A. Smith, 1898. Plate 63, fig. 13.

Macoma Suteri, E. A. Smith, P. Mal. S., iii, 1898, 23, f. vi in text.

Shell small, slightly inequilateral, very thin, whitish, finely concentrically striated. *Beaks* prominent, acute. *Anterior end* very little shorter than the posterior, broadly rounded, the dorsal margin lightly excavated in front of the beaks, slowly descending; *posterior end* much narrower, very narrowly convex, the dorsal margin straight, rapidly descending; basal margin broadly curved. *Sculpture* consisting of very fine concentric striæ. *Epidermis* very thin, grey, not shining. *Colour* grey. *Interior* yellowish-white, shining, faintly radially striated. *Margins* smooth, sharp. *Hinge:* Right valve with 2 divergent cardinals; left valve with 1 bifid cardinal tooth. *Ligament* elongate, the anterior part prominent; there is an oblique internal resilium behind the cardinals, directed backwards, connected above with the external ligament underneath the umbones. *Adductor-scars* unequal, the anterior large, high, and narrow, the posterior large, rounded. *Pallial sinus* deep, rounded.

Length, 15 mm.; height, 12 mm.; diameter, 5·5 mm.

Type in the British Museum.

Hab.—Lyttelton, in 2–4 fathoms (H. S.).

Fam. **SEMELIDÆ**, Dall.

Animal having the mantle widely open for the passage of a large, pointed, compressed, and not byssiferous foot. External gill-plate directed upwards. Siphons separate and excessively long.

Shell orbicular or elongated oval, equivalve, generally compressed, with an external ligament and an internal resilum lodged in a fossette; hinge variable; the cardinal teeth inconspicuous or obsolete; lateral teeth not constant; pallial sinus very deep, rounded.

Genus 1. Leptomya, A. Adams, 1864.

Leptomya, A. Adams, A.M.N.H. (3), xiii, 1864, 208; not of Conrad, 1867. Type: *L. cochlearis*, Hinds.

Shell small, convex, rostrate behind; surface lamellate; right valve with 2 cardinal teeth, left valve with 1 cardinal; there are no lateral teeth; resilifer oblique; pallial sinus deep.

1. **Leptomya lintea**, Hutton, 1873. Plate 54, figs. 14, *a–c*.

Tellina decussata, Lamarck: Hutton, C.M.M., 67; not of Lamarck. *T. lintea*, Hutton, *op. cit.*, 67. *T. suborata*, Sowerby: Hutton, *op. cit.*, 67; J. de Conch., xxvi, 47; M.N.Z.M., 144; P.L.S. N.S.W., ix, 521, not of Sowerby. *T. Strangei*, Deshayes: Hutton, J. de Conch., xxvi, 47; M.N.Z.M., 144; Plioc. M., 80; Index, 91, not of Deshayes. *Leptomya lintea*, Hutton: Suter, P. Mal. S., vii, 1907, 213, pl. 18, f. 10.

Shell oval, thin, somewhat pellucid, more or less inequilateral, angular behind, concentrically and radially striated. Beaks prominent, approximate, curved inwards. *Anterior end* regularly rounded, the dorsal margin straight, very little descending; *posterior end* narrowed, sometimes a little longer, subangular, slightly folded, the dorsal margin convex, oblique; basal margin broadly rounded. *Lunule* clearly defined, lanceolate, with oblique sublamellar folds, devoid of radiate sculpture. *Escutcheon* ill defined. *Sculpture* consisting of fine subequidistant concentric striæ, with better-marked periods of rest, sometimes lamellar at the posterior end, where a distinct fold runs down from the beaks; this concentric sculpture is reticulated by exceedingly fine and close-set radiate striæ. *Epidermis* thin and light-yellowish, easily rubbed off. *Colour* mostly white, sometimes inconspicuously banded with darker and lighter yellowish-brown. *Interior* white, porcellanous, the margins smooth. *Hinge-plate* narrow and short; the right valve with 2 simple slightly triangular cardinals, the anterior oblique; posteriorly a narrow and very oblique resilium; left valve with 1 stout bifid or trifid cardinal, in front of which is sometimes, but not always, a small lateral tooth. *Ligament* short, with very slender nymphæ. The anterior *adductor-scar* is oblong, not very distinct, the posterior scar round or oval, and well impressed. *Pallial sinus* deep and broad, rounded in front, not coalescent at the base with the pallial line.

Length, 25 mm.; height, 17 mm.; diameter, 10 mm. (from Stewart Island). Length, 14 mm.; height, 11 mm.; diameter, 6 mm. (from Auckland).

Type in the Dominion Museum, Wellington.

Hab.—Stewart Island (type); Banks Peninsula; Petane; Hauraki Gulf, from low-water mark to 25 fathoms; Manukau Harbour.

Fossil in the Pliocene.

Fam. **MESODESMATIDÆ**, Deshayes.

Animal having the external branchial plate directed ventrally; siphons separate and equal; foot large, triangular, not byssiferous.

Shell solid and heavy, usually Donaciform, equivalve, not gaping; with erect or opisthogyrate beaks; hinge usually with a cardinal tooth in each valve in front of an internal central resilium; lateral teeth almost always well developed anteriorly and posteriorly; adductor-scars deeply impressed; pallial line sinuous or simple.

Tertiary to Recent.

Genus 1. Mesodesma, Deshayes, 1831.

Mesodesma, Deshayes, Ency. Méth. Vers, ii, 1831, 441. Type: *Mactra donacia*, Lamarck.

Animal with the borders of the mantle smooth; siphons cylindrical, distinct, long, the anal siphon with conic tubercles, the branchial pinnate; foot long, laterally compressed, triangular, pointed; palps triangular; gills very unequal.

Shell subtrigonal, depressed; anterior side the longer; hinge thick, carrying a spoon-shaped depression for the ligament (resilium), in the centre, a small bifid or double cardinal tooth in front of the ligament-pit; anterior and posterior lateral teeth double on the right valve, single on the left; pallial sinus more or less deep.

Distribution.—Mediterranean, east coast of North America, west coast of South America, Indian Ocean, Philippines, Australasia.

Fossil in the Tertiary. The genus is represented in the Eocene of Australia, and most likely migrated from there to New Zealand.

Key to Subgenera.

A. Shell triangularly oblong; anterior end longer.
  a. Pallial sinus shallow, rounded; ligament small, obsolete .. Donacilla.
  aa. Pallial sinus reaching to near the centre, rounded; ligament short, strong, partly external .. .. .. Taria.
B. Shell oblong-oval, the beaks at or near the middle; pallial sinus small, angular; ligament small, almost wholly internal .. Paphies.

Subgen. 1. Donacilla (Lam.), Philippi, 1836.

Donacille, Lamarck, Extr. d'un Cours, 1812, 107. *Donacilla*, Philippi, Moll. Sicil., 1836, 37. *Amphidesma* sp., Lamarck, 1818. *Mesodesma* sp., Deshayes, 1830. *Erycina* sp., Sowerby, 1822. Type: *Mesodesma corneum*, Poli; Mediterranean.

Ligament marginal, obsolete; laterals not sulcate, the anterior lateral long, the posterior short, stout, triangular, with the posterior margin of the cartilage-pit raised and thickened like a second tooth; posterior ventral lamina in the right valve triangular, stout, elevated, vertically directed, the dorsal lamina obsolete, the anterior laminæ elongated.

Distribution.—Europe and Australasia.

1. **Mesodesma subtriangulatum**, Gray, 1825. Plate 59, fig. 19.

Erycina subtriangulata, Gray, Thomson's Ann. Philos., xxv, 1825. *Mesodesma subtriangulata*, Gray, Dieff. N.Z., 252. *Atactodea subtriangulata*, Gray, Index, 91. *Mesodesma latum*, Deshayes, in Guérin's Mag. Zool., 1843, 80; Conch. Icon., 1854, f. 4; C.M.M., 68; Crit. List, 43; Hutton, J. de Conch., xxvi, 48; M.N.Z.M., 146. *M. spissa*, Reeve, Conch. Icon., 1854, f. 18; C.M.M., 68; Crit. List, 43; Hutton, J. de Conch., xxvi, 48; M.N.Z.M., 146. *Paphia spissa*, Reeve: Hutton, P.L.S. N.S.W., ix, 519. *Mesodesma cuneata*, Lamarck: Hutton, C.M.M., 68; Crit. List, 43, not of Lamarck.

Shell moderately large, triangularly oblong, very inequilateral, solid, posteriorly truncated almost smooth, polished, compressed.

Beaks at the posterior third of length, approximate, not prominent, slightly directed backwards. *Anterior end* much longer, produced, rounded, the dorsal margin long and straight, gently descending; *posterior end* straight above, lightly convex below, rapidly descending, subangled towards the basal margin, which is very little convex behind, but regularly arched towards the anterior margin. *Escutcheon* broad, well limited by a keel on each side, descending from the beaks in the direction of the posterior angle of the valves. *Sculpture* consisting of irregular concentric striæ, more distinct at the anterior end and finely lamellate on the lower part of the escutcheon; faint radiate striæ are present. *Epidermis* thin, horny, polished. *Colour* fuscous-white. *Interior* white, porcellanous, polished outside the pallial line, with a number of rays directed from the beaks towards the base. *Margins* with faint radiate striæ inside. *Hinge-plate* massive, triangular; right valve with a very thin oblique cardinal in front of the resilifer, and 2 elongate lateral teeth in front, the lower of which is stronger and raised at both ends, 2 shorter lateral teeth behind the resilifer, the lower triangular, stout, very little oblique, the upper small; left valve with 1 high lamellar oblique cardinal, 1 slender elongated anterior and 1 stout triangular posterior lateral; the resilifer central, spoon-shaped, its posterior margin raised. *Ligament* very small, amphidetic, external. *Adductor-scars:* The anterior scar is pyriform, well impressed; the posterior scar roundish, less deep. *Pallial line* far removed from the margin, the sinus rather small, broadly rounded, and slightly ascending.

Length, 47 mm.; height, 31 mm.; diameter, 14 mm. (usual size) Length, 74 mm.; height, 50 mm.; diameter, 21 mm. (large form).

Type in the British Museum.

Hab.—North and South Islands, between tide-marks; more common in the South. Chatham Islands; Kermadec Islands (Captain Bollons).

Remark.—This mollusc is much used as food by the Maoris and white people.

Maori.—Tua-tua (*teste* Hutton); kahitua (*teste* Captain Bollons).

Fossil in the Miocene and Pliocene.

Subgen. 2. Taria, Gray, 1853.

Taria, Gray, A.M.N.H., 1853, 44. Type: *Mesodesma ventricosum*, Gray.

Shell subtrigonal, subequilateral, the hinge concentrated; the laterals smooth, subequal, short; the ligament short, strong, mostly internal; the resilium narrow; chondrophore depressed, projecting prominently downward; pallial sinus well marked, sometimes deep.

Distribution.—New Zealand and the eastern coast of South America.

2. Mesodesma ventricosum, Gray, 1843. Plate 59, fig. 18.

Mesodesma ventricosa, Gray, Dieff. N.Z., 1843, 252; C.M.M., 68; Crit. List, 43; Ereb. & Ter., 5, pl. 3, f. 6; Hutton, J. de Conch., xxvi, 48; M.N.Z.M., 145. *Paphia ventricosa*, Gray: Hutton, P.L.S. N.S.W., ix, 519. *Mesodesma elongata*, Quoy and Gaimard: Hutton, C.M.M., 68; not of Quoy and Gaimard.

Shell large and solid, ovate, wedge-shaped, inequilateral, truncated behind, ventricose, white or fulvous. *Beaks* slightly raised, approximate, directed slightly backwards. *Anterior end* much longer than the posterior, regularly rounded, the posterior margin long and straight, very slowly descending; *posterior end* short, truncated, and narrowly convex towards the basal margin, the dorsal slope steep, nearly straight; basal margin slightly rounded, ascending posteriorly. *Escutcheon* broad and long, flattish, bordered on each side by 2 ribs descending from the beaks towards the truncation of the posterior end. *Sculpture* consisting of fine, dense, somewhat irregular concentric striæ, more prominent at the ends, and very faint radiate striæ, more distinct on the anterior part of the valves. *Epidermis* thin, horn-coloured, pellucid, extending beyond the margins. *Colour* usually dirty-white, sometimes light fulvous. *Interior* white, porcellanous, shining, with numerous rather distant radial rays. *Margins* simple, thin and sharp. *Hinge:* Right valve with a very slender sharp cardinal at the front of the resilifer, and 2 anterior and 2 posterior lateral teeth, the former longer than the latter; left valve with a stout, compressed, oblique cardinal, and 1 anterior and 1 posterior lateral tooth, both of about the same length and strength. *Resilifer* narrowly triangular, extending far downward, the resilium very strong, pyriform in cross-section. *Ligament* amphidetic, short, the posterior part thicker and connected with the resilium. *Adductor-scars* subequal, pyriform, the anterior deeper and surrounded by a prominent callosity on the posterior side. *Pallial line* far removed from the margins, especially on the anterior end; pallial sinus horizontal, not quite reaching to the middle of the disc, extending above from the lower margin of the posterior scar, its anterior end semicircular.

Length, 112 mm.; height, 70 mm.; diameter, 37 mm.

Type in the British Museum.

Hab.—North and South Islands, in sand between tide-marks; more common on the northern shores, especially on the west coast.

Remarks.—The animal of this species is considered a great delicacy by many people, and is sometimes exhibited for sale in Auckland fish-shops.

Maori.—Tairaki (*teste* Captain Bollons). In the North generally known under the name toheroa.

Subgen. 3. PAPHIES. Lesson, 1830.

Paphies, Lesson, Voy. Coq., ii, 1830, pt. 1, 424. *Machæna* (Leach, MS.), Gray, 1843. *Mesodesma*, Auct. *Paphia*, Hutton, 1885; not of Lamarck. Type: *Mya australis*, Gmelin.

Shell elongated, subequilateral, subsoleniform, solid: hinge concentrated, heavy; laterals smooth or finely granulose, short; ligament short, mostly internal, small; resilium narrow, vertical; the chondrophore projecting; pallial sinus very small, angular.

New Zealand only.

3. Mesodesma australe, Gmelin, 1790. Plate 59, fig. 17.

Mya novæ-zeelandiæ, Chemnitz, Conch. Cab., vi, 1782, f. 19, 20; not binomial. *Mesodesma novæ-zeelandiæ*, Chemn., Conch. Icon., viii, 1854, f. 21; Ad. G.R.M., ii, 413, pl. 106, f. 2; C.M.M., 68; Crit. List, 43; Hutton, J. de Conch., xxvi, 48; M.N.Z.M., 145. *Paphia neozelanica*, Chemn.: Hutton, P.L.S. N.S.W., ix, 519. *Mya australis*, Gmelin, Syst. Nat., ed. 13, 1790, 3221. *Mesodesma australis*, Gmelin: Hedley, Bull. Colon. Museum, No. 1, 1905 (1906), 48; Suter, T.N.Z.I., xxxviii, 319. *Paphies Roissyana*, Lesson, Voy. Coq., ii, 1830, 424, pl. 15, f. 4. *Mesodesma Chemnitzi*, Deshayes, Ency. Méth., ii, 1831, 443; Voy. Astrol., iii, 1835, 504, pl. 82, f. 9–11; Dieff. N.Z., 252; C.M.M., 68. *M. subtriangulata*, Gray: Griffith and Pidgeon, "Cuvier's Mollusca," xii, 1834, pl. 22, f. 2; not of Gray, 1825. *M. ovalis*, Deshayes, P.Z.S., 1854, 336; Conch. Icon., viii, 1854, f. 7; C.M.M., 68; Crit. List, 44; M.N.Z.M., 145.

Shell moderately large, oblong-oval, transverse, solid, subequilateral, rounded at both ends, convex, compressed towards the margin, whitish. *Beaks* not prominent, convex, approximate. *Anterior end* sometimes a little longer than the posterior, narrowly rounded, the dorsal margin straight, very slowly descending; *posterior end* a little higher, regularly rounded, the dorsal margin faintly convex, slowly descending; basal margin straight. *Escutcheon* not distinctly marked off. *Sculpture* consisting of fine concentric lines, slightly lamellate at the posterior end. *Epidermis* thin, horn-colour. *Colour* whitish, very often with rust-stains at the dorsal anterior part. *Interior* white, porcellanous, with faint radiate striation at the margins. *Hinge* short and broad, heavy; right valve with 1 thin and low cardinal lamella in front of the resilifer and 2 lateral teeth in front and behind, those near the centre very stout, minutely granulose, the outer and upper ones very small; left valve with a stout nearly vertical cardinal and 2 strong oblique short triangular lateral teeth. *Resilifer* vertical, narrow, much produced downward posteriorly. *Ligament* feeble, internal, posterior, triangularly produced downward behind the resilium and sometimes partly separated from it by a small lamella. *Adductor-scars* deeply impressed, unequal, the anterior smaller, pyriform, the posterior roundish. *Pallial line* deep, the inner part of the disc very thick; the sinus very small, triangular.

Length, 60 mm.; height, 35 mm.; diameter, 21 mm.

Hab.—North and South Islands; Chatham Islands; on sandy flats between tide-marks; common. Brought to England by Captain Cook.

Maori.—Pipi, kokota, (*teste* Hutton).

Fossil.—Miocene and Pliocene.

Var. **aucklandicum**, von Martens, 1879.

Mesodesma aucklandicum, von Martens, S.B. Ges. naturf. Freunde, Berlin, 1879, 37.

Distinguished from the species: The shell is much larger and ponderous, more ventricose, of a dark-fuscous colour, the posterior end hardly higher than the anterior; the hinge is still more concentrated, the lateral teeth stouter and slightly shorter.

Length, 67 mm.; height, 39 mm.; diameter, 23 mm. (type). Length, 90 mm.; height, 54 mm.; diameter, 32 mm. (specimen collected by Captain Bollons).

Type in the Kgl. Museum für Naturkunde, Berlin.

Hab.—Auckland Islands (Hermann Krone, Captain Bollons).

Fam. MACTRIDÆ, Gray.

Animal with the external branchial plate directed ventrally; siphons united, more or less invested by a chitinous sheath; foot long, stout, bent at an angle, and without a byssus.

Shell porcellanous, with an obvious epidermis, usually rounded triangular, with smooth or concentrically sculptured surface, smooth margins, and prominent prosogyrous beaks; valves equal, free, usually with a slight posterior gape; area not limited; ligament variably external or internal; resilium connecting subtriangular chondrophores usually excavated out of the hinge-plate, rarely with a prop or buttress; hinge-plate well developed, with normally an anterior and posterior lateral in the left, received into sockets or paired laminæ in the right valve, or obsolete; cardinals in the right valve 2, with their dorsal edges usually soldered together, and 1 bifid or deltoid cardinal in the left, fitting below the former, a delicate accessory lamella often present in either valve, or all may be more or less obsolete.

Cretaceous to Recent.

Subfam. MACTRINÆ.

Siphons partially or wholly naked, wholly retractile within the shell; mantle, between siphons and anterior adductor, chiefly open ventrally.

Shell subequilateral, nearly closed. Hinge: In the left valve an anterior and posterior lateral lamina, and a bifid or Λ-shaped cardinal tooth in front of a pit for the resilium; above the latter a scar or surface of insertion for the ligament. In the right valve 2 anterior and 2 posterior laminæ, between which the laterals of the opposite valve are received; 2 lamellar cardinal teeth, inclined to each other

at an angle above, and usually more or less solidly united at this line of junction; behind them the resilifer, and above the scar of the ligament.

KEY TO GENERA.

A. Dentition normal, as described for the subfamily; laterals smooth or granular; ligament separated from resilium by a shelly lamina.. .. .. MACTRA.

B. Left cardinal with a small posterior accessory lamella, both projecting over the resilifer; laterals transversely grooved; ligament not separated from the resilium by a shelly lamina .. SPISULA.

Genus 1. MACTRA, Linné, 1767.

Mactra, Linné, Syst. Nat., ed. 12, 1767, 1125; Lamarck, 1799. Type: *M. stultorum*, L. *Trigonella*, Da Costa, 1778; not of Walch, 1762, or Schröter, 1776. *Crassatella*, Lamarck, 1799.

Animal with thick papillate mantle-borders, mantle open in front; siphons united to their extremity, partly covered by a chitinous sheath, the orifices fringed, the anal opening with a tubular valve; foot elongated, large, linguiform, not byssiferous; labial palps long, triangular; branchiæ unequal, the outer narrower and appendiculate. Shell ovate-trigonal; surface smooth or concentrically striated. Dentition normal in number and distribution of teeth; ligament set off by a shelly lamina rising between chondrophore and ligament; cardinals generally coalescent above; laterals smooth or finely granular. Pallial sinus round or angulate.

Distribution.—About 150 species from all seas.

Fossil in the Cretaceous and Tertiary, the maximum in the Miocene.

Vernacular Name.—Trough-shell.

SYNOPSIS OF SUBGENERA.

A. Shell equilaterally oval; pallial sinus high, rounded in front; ligament completely shut off from the resilium; resilifer roofed apically; laterals long; anterior sinus with a buttress upon which stands the anterior arm of the cardinal; anterior right cardinal adjacent to the dorsal shell-margin CŒLOMACTRA.

B. Shell inequilateral, with coarse epidermis; ligament lanceolate, sunken; teeth and laminæ short; anterior right cardinal lying in the plane of the ventral lamina .. MACTRODERMA.

C. Shell subequilateral, elongate; pallial sinus large; valves gaping; resilifer large, shallow, apically roofed; cardinals prominent, their posterior arms projecting over the resilifer, each anterior arm with an accessory lamella in nearly the same plane, appressed to the lateral .. MACTROTOMA.

Subgen. 1. CŒLOMACTRA, Dall, 1895.

Cœlomactra, Dall, P. Mal. S., i, 1895, 211. Type: *Mactra violacea* (Ch.), Gmelin. *Cœlomactra*, Dall, Trans. Wagn. Free Inst., iii, pt. 4, 1898, 875.

Shell equilaterally oval, thin, inflated, with a thin lineated epidermis; dorsal areas grooved; beaks adjacent; pallial sinus very short, high, rounded; valves nearly close-fitting, convex; ligament

sagittate, linear, completely shut off from the chondrophore by shelly matter; dental armature not concentrated; laterals long, thin, and flexuous, distally confluent with the hinge-plate margin, as is the anterior ventral lamina; anterior sinus roofed by a buttress, upon which stands the anterior arm of each cardinal, and from under which the laterals emerge; chondrophore roofed at the apex; right cardinal not coalescent above, the anterior arm adjacent to the dorsal shell-margin; hinge-plate very oblique, especially in front, forming a deep recess extending to the beaks.

1. **Mactra scalpellum,** Reeve, 1854. Plate 63, fig. 14.

Mactra scalpellum, Reeve, Conch. Icon., viii, 1854, pl. 19, f. 106; Deshayes, P.Z.S., 1854 (1855), 65; C.M.M., 63; Crit. List, 43; Hutton, J. de Conch., xxvi, 45; M.N.Z.M., 138; P.L.S. N.S.W., ix, 517; Murdoch, T.N.Z.I., xxxii, 221, pl. 20, f. 10; Hedley, T.N.Z.I., xxxviii, 75. *Darina pusilla*, Hutton, C.M.M., 64.

Shell small, triangularly oblong, thin, compressed, equilateral, smooth, shining, yellowish-white. *Beaks* produced, acute, approximate. *Anterior end* narrowly rounded, the dorsal margin straight, slowly descending; *posterior end* subangular or very narrowly convex, the dorsal margin very little arched, descending at the same angle as the anterior; basal margin broadly convex; an indistinct ridge descending posteriorly from the umbo. *Sculpture* consisting of very fine and faint concentric striæ, produced into sharp riblets on the dorsal areas. *Epidermis* thin, shining. *Colour* yellowish-white. *Interior* bluish-white, polished, smooth. *Margins* simple, sharp. *Hinge:* Right valve with the anterior cardinal long, oblique, descending to the lower lateral tooth, the posterior cardinal short, directed towards the apex of the resilifer, 2 anterior and 2 posterior long laterals; left valve with a hooked cardinal in front of the resilifer, the posterior arm much shorter, 1 anterior and 1 posterior long lateral; resilifer triangular, large, roofed above. *Ligament* small, sagittate, close behind the beaks, not connected with the resilium. *Adductor-scars* subequal, large, not deep. *Pallial sinus* moderately large, high, rounded in front.

Length, 24 mm.; height, 15 mm.; diameter, 6·5 mm.

Type in the British Museum.

Hab.—New Zealand (Strange): near Cuvier Island, in 38 fathoms (Captain Bollons); off Great Barrier Island, in 110 fathoms; near Little Barrier Island, in 20 fathoms; near Channel Island, Hauraki Gulf, in 25 fathoms.

Fossil in the Pliocene.

Subgen. 2. MACTRODERMA, Dall, 1894.

Mactroderma, Dall, "Nautilus," viii, 1894, 39; Trans. Wagn. Free Inst., iii, pt. 4, 875. Type: *Mactra velata*, Philippi.

Shell inequilateral, rude, with a coarse epidermis, pronounced pedal gape, a lanceolate sunken ligament, an inconspicuous spur;

dental armature concentrated, teeth and laminæ short, the anterior arm of the right cardinal lying in the plane of the ventral lamina; otherwise as in *Mactra*.

Sect. 1. Cyclomactra, Dall, 1895.

Cyclomactra, Dall, P. Mal. S., i, 1895, 211; Trans. Wagn. Free Inst., iii, pt. 4, 875. Type: *Mactra tristis*, Gray.

Shell subcircular, compressed, pedal gape obsolete, ligament submerged except the tip, but wholly separated from the resilium; remainder of characters like *Mactroderma*.

Australian seas and New Zealand.

2. Mactra discors, Gray, 1837. Plate 60, figs. 1, *a*.

Mactra discors, Gray, A.M.N.H., i, 1837, 371; Conch. Icon., viii, f. 17; Dieff. N.Z., 251; C.M.M., 63; Crit. List, 43; Ereb. & Ter., 5, pl. 2, f. 4; Hutton, J. de Conch., xxvi, 45; M.N.Z.M., 138; P.L.S. N.S.W., ix. 517. *M. Murchisoni*, Deshayes, P.Z.S., 1854 (1855), 64; Conch. Icon., viii, f. 76; C.M.M., 63; Crit. List, 43; M.N.Z.M., 138.

Shell rather large, rotundately ovate, somewhat triangular, rather thick, subequilateral, regularly convex, posterior slope depressed, linearly keeled, yellowish-white. *Beaks* small, approximate, directed forwards, smooth, white. *Anterior end* somewhat shorter, compressed, convex, the dorsal margin straight, descending; *posterior end* flattened above, broadly convex, surrounded with a slightly keeled obtuse angle, slightly angularly produced below; basal margin regularly broadly convex. *Sculpture* consisting of fine growth-lines produced into sharp oblique riblets on the lunular area, and faint radiate striæ. *Epidermis* yellowish or light brown, wrinkled, thin, usually only present near the margins. *Colour* greyish-white, yellowish or fulvous where covered by the epidermis. *Interior* white, porcellanous, shining, faintly radially striated. *Margins* smooth and sharp, sometimes with light radiate striæ. *Hinge:* Right valve with a median Λ-shaped cardinal, both arms of equal length, posteriorly with 2 accessory lamellæ, the anterior coalescent with the cardinal, the second more free; 2 lamellæ on each side, which are rather short, the lower ones higher than the others; left valve with 2 cardinal lamellæ which are thin, subparallel, and short, with a posterior accessory lamella which in adult shells is often obsolete; lateral lamellæ short and high; resilifer triangular, with an apical roof. *Ligament* lanceolate, inset, short, behind the umbones, not connected with the resilifer. *Adductor-scars* subequal, not very deep, pyriform. *Pallial sinus* short, broadly rounded above, narrowly in front.

Length, 92 mm.; height, 80 mm.; diameter, 47 mm. (large specimen).

Type in the British Museum.

Hab.—North and South Islands, from the Bay of Islands to Preservation Island; washed up on sandy beaches after heavy gales.

Maori.—Whangaikararo (*teste* Captain Bollons).

Fossil.—Miocene and Pliocene.

Subgen. 3. Mactrotoma, Dall, 1894.

Mactrotoma, Dall, "Nautilus," viii, 1894, 26; Trans. Wagn. Free Inst., iii, pt. 4, 876. Type: *Mactra fragilis*, Gmel. (= *brasiliana*, Lam.). *Standella*, H. and A. Adams, 1856; not of Gray, 1853.

Shell subequilateral, elongate; with a thin, silky epidermis, posterior dorsal areas bordered by an impressed fasciole over which the epidermis is darker-coloured and differently wrinkled; beaks adjacent; pallial sinus large; valves convex, gaping markedly; ligament lanceolate; chondrophore large, shallow, apically roofed; anterior laminæ issuing from the dorsal sinus; cardinals prominent, thin, their posterior arms projecting over the chondrophore; each anterior arm attended by a high accessory lamella in nearly the same plane, closely appressed in the right valve to the ventral lamina, and in the left valve to the anterior lateral, so that to a cursory inspection the lamina appears tridentate and the tooth bidentate.

Key to Species.

A. Shell elongated oval, subtrigonal, compressed, solid	*elongata.*
B. Shell ovate, ventricose, thin, with fine concentric striation ..	*ovata.*
C. Shell suborbicular, compressed, beaks almost median, rudely concentrically striated	*rudis.*

3. Mactra elongata, Quoy and Gaimard, 1835. Plate 60, fig. 2.

Mactra elongata, Q. & G., Voy. Astrol., iii, 1835, 518, pl. 83, f. 1, 2. *Spisula elongata*, Q. & G.: Gray, A.M.N.H., i, 1837, 271; Dieff. N.Z., 251. *Mactra* (*Standella*) *elongata*, Q. & G., Crit. List, 44. *Standella elongata*, Q. & G.: Hutton, J. de Conch., xxvi, 46; M.N.Z.M., 139; Index, 90. *Hemimactra elongata*, Q. & G.: Hutton, P.L.S. N.S.W., ix, 518. *Mulinia notata*, Hutton, C.M.M., 64. *Standella notata*, Hutt., M.N.Z.M., 139. *Hemimactra notata*, Hutt., P.L.S. N.S.W., ix, 518.

Shell elongated oval, a little trigonal, lightly convex, inequilateral, concentrically striated and ribbed, light brown with irregular dark-brown spots and dashes. *Beaks* approximate, not much raised, turned forwards. *Anterior end* shorter, narrowly rounded, the dorsal margin a little excavated in front of the umbones, then slightly convex and slowly descending; *posterior end* narrowly rounded and subtruncated towards the base, the dorsal margin lightly convex, descending; basal margin broadly rounded. *Sculpture* consisting of very fine concentric striæ, rugose ribs towards the base and on the posterior area. *Epidermis* thin, silky. *Colour* yellowish-brown with dark-brown irregular spots and dashes. *Interior* yellowish-white, porcellanous, polished, with faint radiate striation. *Margins* smooth, solid. *Hinge:* Right valve with 2 short diverging cardinals, the posterior very short and extending over the resilifer, a short accessory lamella in front of

the anterior cardinal, appressed to the ventral lamina; 2 anterior and 2 posterior lateral lamellæ, the upper ones thin, straight, sharp, the lower ones thicker and higher, distally raised; left valve with 2 cardinals, the anterior bifid, strong, the upper and slightly posterior tooth small, extending over the resilifer, a rather distant somewhat oblique accessory lamella in front, which is high and triangular, and almost continuous with the anterior lateral tooth, which is slightly raised in front; the posterior lamella is strong, convex; resilifer large, oblique, broadly triangular, apically roofed. *Ligament* small, narrow, and external in front of the umbones, but triangularly sunk behind and coming into contact with the resilium. *Adductor-scars* unequal, the anterior smaller, pyriform, rather deep, the posterior larger, roundish, and shallow. *Pallial sinus* large, reaching to very near the middle of the disc, angularly rounded in front.

Length, 92 mm.; height, 63 mm.; diameter, 34 mm. (type).

Type in the Mus. Hist. Nat., Paris. The type of *M. notata*, Hutton, is in the Dominion Museum, Wellington.

Hab.—North and South Islands, but nowhere common; occasionally washed up after gales. The type specimen of *M. notata* was dredged in 25 fathoms near Stewart Island.

Fossil.—Miocene and Pliocene.

4. Mactra ovata, Gray, 1843. Plate 60, fig. 3.

Spisula ovata, Gray, Dieff. N.Z., 251. *Mactra ovata*, Gray, Conch. Icon., viii, 1854, f. 30; Crit. List, 43. *Hemimactra ovata*, Gray, C.M.M., 63; Hutton, P.L.S. N.S.W., ix, 518. *Mactra (Standella) ovata*, Gray, Ereb. & Ter., 5, pl. 2, f. 2. *Standella ovata*, Gray: Hutton, J. de Conch., xxvi, 45; M.N.Z.M., 139; Index, 90. *Mactra deluta*, Gould, P. Bost. S.N.H., iii, 1850, 215; U.S. Expl. Exp., xii, 391, f. 503. *M. inflata*, Hutton, C. Tert. M., 1873, 18; J. de Conch., xxvi, 46. *M. lævata*, Hutton, T.N.Z.I., xvii, 1884 (1885), 331; Plioc. M., 76, pl. 8, f. 81; Index, 90; Suter, T.N.Z.I., xxxviii, 319. *Standella æqualis*, Webster, T.N.Z.I., xxxvii, 1904 (1905), 280, pl. 10, f. 13.

Shell rather large, thin, inequilateral, rounded ovate, yellowish-brown, smooth, the valves ventricose, posteriorly gaping. *Beaks* tumid, acute, incurved, contiguous. *Anterior end* shortest, sloping rapidly, obtusely rounded, the dorsal margin straight; *posterior end* narrowly rounded, the dorsal margin straight, descending; basal margin convex, straightened and ascending anteriorly. *Anterior area* excavated near the beaks, without a distinctly marked areola, broad, striate; *posterior area* broad, rounded, excavated near the beaks. *Sculpture* consisting of irregular and delicately undulating concentric lines, crossed by fine irregular wrinkles at the posterior end. *Epidermis* thin, silky, yellowish-brown. *Colour* yellowish-brown, the dorsal areas and beaks usually blackish. *Interior* yellowish on the upper parts, bluish-white towards the base, lightly shining. *Margins* smooth, sharp, rather thin. *Hinge:* Right valve with 2 cardinals, the posterior almost vertical, directed over the resilifer, the anterior cardinal thin,

lamellar, close to the dorsal margin and parallel with it; the lateral laminæ short, triangularly raised; left valve with a stout high triangular cardinal and a short obsolete tooth behind and above it, an accessory anterior lamella coalescent with the anterior lateral tooth, which is short and triangularly raised; resilifer large, oblique, roofed apically. *Ligament* short and narrow, very little of it visible externally, the greater part of it above the upper posterior part of the resilifer. *Adductor-scars* unequal, rather small, the anterior pyriform, the posterior roundish. *Pallial sinus* rather broad, ascending, narrowly rounded in front, extending nearly half across the disc.

Length, 73 mm.; height, 56 mm. (type). Length, 85 mm.; height, 66 mm.; diameter, 44 mm.

Type in the British Museum.

Hab.—West coast of the North Island (Dr. Dieffenbach). North and South Islands, in deep mud, estuaries, and by the side of tidal channels.

Fossil in the Pliocene.

5. **Mactra rudis**, Hutton, 1873.

Mactra rudis, Hutton, C. Tert. M., 19; Plioc. M., 77, pl. 8, f. 83; Index, 90.

Shell suborbicular, thin, compressed, and rather sinuated; rudely concentrically striated. Anterior side rather shorter, its dorsal margin straight. Posterior dorsal margin arched. Anterior lateral tooth of the left valve short and high. Lower margin irregular in outline. Pallial sinus deep, rather descending, rounded at the apex. (Hutton.)

Height, 60 mm.; length, 60 mm. (type). Height, 43 mm.; length, 53 mm. (specimen figured by Hutton).

Type, from the Pliocene, in the Dominion Museum, Wellington.

Hab.—Whangaroa Harbour (Professor Thomas).

Fossil in the Pliocene.

Genus 2. Spisula, Gray, 1837.

Spisula, Gray, A.M.N.H., i, 1837, 337, 372; Dall, "Nautilus," viii, 1894, 26, 40; P. Mal. S., i, 211; Trans. Wagn. Free Inst., iii, pt. 4, 878. Type: *Mactra solida* (L.), Gray.

Shell small, subequilateral, trigonal, with a thin epidermis, adjacent beaks, and concentrically grooved dorsal areas; pallial sinus small, rounded; gape obsolete; valves convex; ligament saggitate, set in a callous area close to the dorsal margin and not set off from the chondrophore by any shelly ridge; dental armature normal, strong, not concentrated; the opposed surfaces of the laterals transversely grooved; left cardinal small, prominent, with a small posterior accessory lamella, the posterior ends of both projecting over the chondrophore; right cardinal with the arms coalescent above, the anterior arm close to the dorsal shell-margin; hinge-plate thick and flattish; exterior smooth or concentrically striated; the dorsal areas ill defined. (Dall.)

Subgen. 1. Spisula, s. str.

1. Spisula ordinaria, E. A. Smith, 1898. Plate 63, fig. 16.

Mactra ordinaria, Smith, P. Mal. S., iii, 1898, 23, f. vii in text; Index, 90; Suter, T.N.Z.I., xxxviii, 319. *M. triangulare*, Hector, Cat. Colon. Museum, 1870, 173; not of Lamarck. *M. elegans*, Hutton, C. Tert. M., 19; not of Sowerby.

Shell small, thin, triangularly ovate, inequilateral, horn-colour, the valves somewhat ventricose, the dorsal areas angled at the sides. *Beaks* small, but little raised, incurved, approximate. *Anterior end* shorter, convex, the dorsal margin descending, almost straight; *posterior end* angularly rounded, the dorsal margin long, lightly convex, descending; ventral margin broadly rounded. *Sculpture* consisting of very fine and close concentric striæ, produced into sharp riblets on the dorsal areas. *Epidermis* thin, greyish-white, lightly shining. *Colour* brownish-grey. *Interior* whitish, with faint radiate striæ. *Margins* sharp, smooth. *Hinge:* Right valve with two cardinals, adjacent above, the posterior tooth shorter, parallel to the margin of the resilifer, the anterior and upper cardinal longer, close to the dorsal valve-margin; the 2 anterior and 2 posterior lamellæ rather long, sharp, convexly raised; left valve with a Λ-shaped cardinal and a short accessory lamella behind, which, together with the posterior arm of the cardinal, extend over part of the resilifer; the lateral laminæ long, convexly raised; resilifer small, obliquely triangular. *Ligament* saggitate, small, extending to the apically open resilifer. *Adductor-scars* unequal, the anterior smaller, pyriform, the posterior roundish. *Pallial sinus* broad, not deep, broadly rounded in front.

Length, 13 mm.; height, 9·5 mm.; diameter, 5·5 mm. (type).

Type in the British Museum.

Hab.—Lyttelton Harbour, in 4 fathoms, type (H. S.); Auckland Harbour; off Wanganui, in 20 fathoms; Cook Strait; Blind Bay.

Fossil in the Pliocene.

Subgen. 2. Hemimactra, Swainson, 1840.

Hemimactra, Swainson, Treat. Malac., 1840, 369; Dall, Trans. Wagn. Free Inst., iii, pt. 4, 878. Type: *Mactra solidissima*, Dillwyn.

Shell large, ovate-trigonal, with grooved laterals and rather concentrated hinge; the dorsal areas are not grooved, and the anterior arm of the right cardinal is confluent with its ventral lamina; cardinals markedly compressed. (Dall.)

Sect. 1. Oxyperas, Mörch, 1853.

Oxyperas, Mörch, Cat. Conch. Yoldi, 1853, pt. 2, 4; Dall, Trans. Wagn. Free Inst., iii, pt. 4, 879. Type: *Mactra striatella*, Lamarck.

This section is characterized by its more crudely triangular shape and rather strong concentric sulcation of the surface of the valves. It is chiefly Indo-Pacific in its distribution. (Dall.)

2. Spisula æquilateralis, Deshayes, 1854. Plate 60, figs. 4, *a*.

Mactra æquilateralis, Desh., P.Z.S., 1853 (1854), 17 ; Ereb. & Ter., 5, pl. 2, f. 10 ; Hutton, J. de Conch., xxvi, 45 ; M.N.Z.M., 139 ; T.N.Z.I., xiii, 204. *M. æquilatera*, Desh., Conch. Icon., viii, f. 14 ; C.M.M., 63 ; Crit. List, 44 ; Hutton, P.L.S. N.S.W., ix, 517 ; Index, 90.

Shell moderately large, solid, trigonal, nearly as high as long, concentrically striated, white, dorsal posterior area flattened and laterally sharply angled. *Beaks* approximate, bicarinate, incurved, acute. *Anterior end* subangulated, the dorsal margin rapidly descending, nearly straight ; *posterior end* somewhat longer, sharply angled, the dorsal margin long, rapidly descending, a little convex ; basal margin broadly regularly arched. *Lunular area* large, smooth ; *posterior dorsal area* flattened, slightly raised towards the valve-margins, smooth, with a sharp angle on each side, descending from the umbones to the posterior angle below. *Epidermis* thin, horny, shining, extending beyond the margins, usually lost on the greater part of the shell. *Sculpture* consisting of concentric striæ, raised into sharply rounded riblets on the anterior and ventral parts of the valves ; indistinct distant radial lines are usually visible. *Colour* greyish-white, the lunule and the central part of the escutcheon light brown, the umbones purplish. *Interior* yellowish-white, porcellanous, polished, faintly radially striate. *Margins* smooth, thick, sharp. *Hinge :* Right valve with 2 cardinals, coalescent above, the posterior extending over the resilifer, the anterior close to the dorsal shell-margin ; 2 anterior longer and 2 posterior shorter lamellæ, which are corrugated on the inner sides ; left valve with a small Λ-shaped cardinal and an accessory lamella above and behind, which with the posterior arm of the cardinal extends over part of the resilifer ; the latter is large, oblique, and not separated by shelly matter from the *ligament*, which is short, inset, but visible externally. *Adductor-scars* subequal, triangularly ovate, not deep. *Pallial sinus* not very large, horizontal, narrowly rounded in front.

Length, 77 mm. ; height, 60 mm. ; diameter, 38 mm.

Type in the British Museum.

Hab.—North and South Islands ; commonly found washed up on sandy beaches after gales.

Fossil in the Pliocene.

Subfam. PTEROPSIDINÆ.

Shell subequilateral, nearly closed, thin ; hinge feeble, concentrated, the laterals partly obsolete or much reduced. Siphons wholly retractile, naked ; mantle partially closed ventrally. (Dall.)

Genus 1. RAËTA, Gray, 1853.

Raëta, Gray, A.M.N.H. (2), xi, 1853, 43. Type : *Lutraria canaliculata*, Say. *Raëta*, Dall, Trans. Wagn. Free Inst., iii, pt. 4, 882.

Shell large, inequilateral, thin, inflated, acutely rostrate behind, concentrically plicate ; dorsal areas obscure, the surface of the valves

more or less vermiculate; pallial sinus deep, narrow, pointed; siphonal gape small; ligament submerged except at the anterior end, set off by a shelly ridge which roofs the apex of the pit and partially supports the posterior arm of the cardinal tooth; dental armature concentrated; chondrophore large; left cardinal small, its posterior arm shorter, with a small accessory lamella above, both projecting over the pit; right cardinal with the arms coalescent above, the anterior large, superposed on a feeble anterior lateral, the posterior arm much shorter, projecting over the pit; a single anterior and posterior lateral in each valve, but no paired laminæ.

Distribution.—Each shore of America, Japan, China, Senegal, New Zealand.

Fossil in the Miocene and Pliocene.

1. **Raëta perspicua**, Hutton, 1873. Plate 60, fig. 5.

Raëta perspicua, Hutton, C.M.M., 65; J. de Conch., xxvi, 46; M.N.Z.M., 141; P.L.S. N.S.W., ix, 518; Index, 90.

Ovate, ventricose and rounded in front, compressed and subangular behind; umbones posterior, turned forwards, with broad rounded concentric corrugations that show in the interior, and crossed by fine undulating transverse striæ. Yellowish-white. (Hutton.)

Length, 70 mm.; height, 50 mm.

Type in the Dominion Museum, Wellington; one valve.

Hab.—Bay of Islands. It is said to have been found also at Waikanae Beach, Cook Strait.

I have never been able to get a specimen.

Subfam. ZENATIINÆ.

Shell inequilateral, compressed, thin; hinge concentrated, irregular, the laterals tending to become obsolete or absent; chondrophore bent out of the plane of the hinge-plate, and more or less adherent to the valve.

Siphons contractile, naked; ventral opening of the mantle and foot variable.

Key to Genera.

A. Anterior end very short, rounded; shell siliquiform; below the cardinals an obscure thickened ray, not extending to the pallial line .. .. ZENATIA.

B. Anterior end slightly longer than the posterior, rostrate; shell lanceolate; with 2 internal thickened radiate ribs, extending to the pallial line .. .. RESANIA.

Genus 1. ZENATIA, Gray, 1852.

Zenatia, Gray, A.M.N.H. (2), x, 1852, 43. Type: *Z. zelandica*, Gray = *acinaces*, Q. & G. *Zenatia*, Dall, Trans. Wagn. Free Inst., iii, pt. 4, 888. *Metabola*, C. Mayer, 1867.

Shell inequilateral, thin, compressed, siliquiform, smooth, with a conspicuous epidermis; dorsal area obscure; beaks inconspicuous,

adjacent, very anterior; lunular area encroaching on the inner dorsal margin, hardly visible externally; pallial sinus very deep, gapes conspicuous, the valves hardly touching except at the hinge and ventral margin; ligament lanceolate, short, somewhat sunken, not set off by any shelly barrier from the pit; chondrophore oblique, large, posteriorly depressed below the hinge-plate, resilium homogeneous and continuous between the valves; dental armature concentrated; left cardinal large, with an obscure accessory lamella between it and the ligament; a short high anterior lateral parallel with the anterior arm of the cardinal, above which descends the lunular area; behind the ligament a very small narrow posterior lateral (often lost) lies adjacent to the dorsal margin; valves below the cardinals reinforced by an obscure thickened ray of shell-substance, but which does not support the chondrophore; upon this ray, behind the adductors and below the ventral sinus of the cardinal, are the scars of the pedal retractors; right valve with the cardinal wide, hardly coalescent above, with 2 very small posterior but no anterior laminæ; both the cardinals are wholly exterior to the pit. (Dall.)

Distribution.—New Zealand and Australia.

Fossil in the Miocene and Pliocene of New Zealand. An allied genus, *Zenatiopsis*, Tate, is recorded from the Miocene of Victoria.

1. Zenatia acinaces, Quoy and Gaimard, 1835. Plate 60, figs. 6, *a*.

Lutraria acinaces, Q. & G., Voy. Astrol., iii, 1835, 545, pl. 83, f. 5, 6; Dieff. N.Z., 251; Conch. Icon., viii, 1854, f. 14. *Zenatia acinaces*, Q. & G., Ad. G.R.M., pl. 102, f. 1; C.M.M., 64; Crit. List, 43; M.N.Z.M., 140; Hutton, J. de Conch., xxvi, 46; P.L.S. N.S.W., ix, 518. *Z. zelandica*, Gray, A.M.N.H. (2), x, 143. *Lutraria Deshayesi*, Reeve, Conch. Icon., viii, 1854, f. 1; Crit. List, 43. *Zenatia Deshayesi*, Reeve, M.N.Z.M., 140. *Z. solenoides*, Deshayes, P.Z.S., 1854 (1855), 72. *Z. Cumingiana*, Desh., *op. cit.*, 72.

Shell moderately large, oval, elongated, compressed, rounded and gaping on both ends, equivalve but very inequilateral, concentrically striated, yellowish to brown. *Beaks* small, very little raised, approximate, incurved. *Anterior end* very short, occupying about one-fifth of the length of the shell, convex; *posterior end* rounded or subtruncated, the dorsal margin long, slightly concave or straight, horizontal; basal margin straight, curved towards both ends. *Lunule* encroaching on the inner dorsal margin. *Sculpture* consisting of fine close concentric striæ with oblique fine folds of the epidermis at both ends. *Epidermis* thin, light brown, shining, extending a little beyond the margins of the valves. *Colour* yellowish-white in young specimens, brown in adult shells. *Interior* bluish-white, shining, slightly iridescent, with a prominent callosity behind the anterior scar, and 2 fine ridges descending from the beaks, one to the anterior

part of the pallial sinus and the other to the anterior lower side of the posterior adductor. *Margins* smooth, thin and sharp. *Hinge:* Right valve with 2 cardinals of equal length, united above, Λ-shaped, and 2 posterior lateral laminæ, the upper obsolete; left valve with a high Λ-shaped cardinal, both arms of which are of equal length, a low sharp accessory lamella behind it, 1 high triangular lateral tooth in front, and a rather long, thin, and slightly raised posterior lamella; resilifer very oblique, triangular. *Ligament* rather short, thin, the greater part of it internal. *Adductor-scars* subequal, the anterior oval, deep, with 2 oblong pedal retractor scars behind it, the posterior scar shallow, irregularly rounded. *Pallial sinus* deep and high, extending to beyond the middle of the valve, anteriorly narrowly convex.

Length, 47 mm.; height, 18 mm.; diameter, 8·5 mm. (type). Length, 94 mm.; height, 45 mm.; diameter, 15 mm. (large specimen).

Animal (Dall, P. Mal. S., iii, 86).—Siphons naked, and completely united, the opening surrounded by conspicuous papillæ; mantle-edges smooth, united in front and forward on the ventral margin; foot quadrate, compressed, smooth; labial palpi long and large, their free ends extending behind the foot; the ctenidia are symmetrical, coarsely plicate, and extend forward, diminishing in size, a considerable distance between the palpi.

Type in the Mus. Hist. Nat., Paris.

Hab.—North and South Islands, from below low-water mark to about 30 fathoms; in some places, like New Brighton, it is evidently common in a depth of from 3 to 5 fathoms.

Remarks.—In Trans. Wagn. Free Inst., iii, pt. 4. 888, Dr. W. H. Dall says that the type, *Z. acinaces*, differs from *Z. Deshayesi* by the total absence of lateral teeth. This is not correct, for Quoy and Gaimard say, "En avant de la dent cardinale gauche en est une latérale bien marquée, fort raprochée et triangulaire." This part is, unfortunately, left out in the translation of the diagnosis given by Hutton. I have examined many specimens, and always found this anterior lateral, and mostly also the posterior lateral lamina, to be present.

The material from various localities, as represented in my collection, leads me to the conclusion that the typical form is from deeper water, about 10 to 30 fathoms: *Z. Deshayesi* and *Z. solenoides* are large forms living in lesser depth, from below low-water mark to about 5 or 10 fathoms, and *Z. Cumingiana* is a half-grown form of the latter, being found associated with the large shells. All the small specimens from deep water have the dorsal margin more or less excavated; but between these and the large forms all intermediate grades are found.

Maori.—Peraro (*teste* Captain Bollons).

Fossil in the Miocene and Pliocene.

Genus 2. Resania, Gray, 1852.

Resania, Gray, A.M.N.H. (2), x, 1852, 43. Type: *R. lanceolata*, Gray. *Resania*, Dall, Trans. Wagn. Free Inst., iii, pt. 4, 889. *Vanganella*, Gray, 1853. *Myomactra*, C. Mayer, 1867. *Laminaria*, C. Mayer, 1867.

Shell inequilateral, thin, compressed, lanceolate, smooth, with a conspicuous epidermis; dorsal areas obscure; beaks very low, adjacent, somewhat posterior; pallial sinus short, broad, gapes conspicuous; ligament small, short, lanceolate, not set off from the pit by a shelly ridge; chondrophore large, oblique, posteriorly depressed below the hinge-plate and resting on a radial thickened rib, which extends from the beaks towards the base behind the posterior adductor; a second rib of the same sort reinforces the valve behind the anterior adductor; resilium homogeneous, dental armature concentrated; left cardinal strong, prominent, petaloid, with a thin posterior accessory lamella, which, with posterior arm of the tooth, projects slightly over the pit; a short, thin, well-elevated lateral tooth on each side of the beak; a small but deep lunular inflection of the anterior dorsal margin; right cardinal low, wide, the anterior arm superposed on the ventral lamina; the anterior dorsal lamina very small between the arm of the cardinal and the lunular inflection; posterior arm of the cardinal projecting a little over the pit; the posterior laminæ small but distinct. (Dall.)

Distribution.—New Zealand; a single species.

1. Resania lanceolata, Gray, 1852. Plate 60, figs. 7, *a*.

Resania lanceolata, Gray, A.M.N.H. (2), x, 1852, 43. *Lutraria* (*Vanganella*) *lanceolata*, Gray, Crit. List, 43; Conch. Icon., viii, f. 17; Index, 90. *Vanganella Taylori*, Gray, P.Z.S., 1851 (1853), 125; C.M.M., 65; Ereb. & Ter., 5, pl. 2, f. 5; Hutton, J. de Conch., xxvi, 46; M.N.Z.M., 140; P.L.S. N.S.W., ix, 518; Ad. G.R.M., ii, 385, pl. 102, f. 2.

Shell moderately large, lanceolate, inequilateral, rather compressed, white with a yellowish epidermis, concentrically striated. *Beaks* small, inconspicuous, incurved. *Anterior end* somewhat longer than the posterior, slightly rostrate, narrowly rounded, the dorsal margin lightly convex, slowly descending; *posterior end* with the valves gaping, broadly rounded, a faint ray passing from the umbo to the middle of the posterior margin on each valve; basal margin very little curved. *Sculpture* consisting of fine unequal concentric striæ, with wrinkles of the epidermis on the upper hinder slope. *Epidermis* thin, yellowish-brown, usually worn off on the upper part of the valves. *Colour* white where the epidermis is lost, light yellowish-brown on the vertical part, darker brown on the upper part of the front edge. *Interior* with 2 strong radial ribs, white, lightly iridescent in some places. *Margins* smooth, thin and sharp. *Hinge* normal, as described for the genus. Ligament very short, behind the beaks. *Adductor-scars* large, not deep, the anterior pyriform, the posterior oval. *Pallial sinus* high and short, straight in front, ending at the posterior radial rib.

Length, 100 mm.; height, 49 mm.; diameter, 18 mm.

Animal (Dall, P. Mal. S., iii, 85).—Animal having the siphons naked, slender, closely united to their very tips, the orifices nearly in the same plane and surrounded by small papillæ. The mantle has a thickened edge, smooth for the most part, but near the ends of the shell more or less papillose, with rather distant papillæ. The mantle is completely open, except in the central portion of the dorsal margin, not even being united where its margins pass around the adductors. The foot is compressed, sharp-edged, pointed, large and muscular, with no obvious byssal groove, and of a lanceolate outline. Its edges are entire. The palpi are large, narrow, long, smooth externally, plicate internally, adherent near the small circular mouth. They extend beyond the posterior edge of the visceral mass, becoming distally free and twisted at the ends. The body is connected with the siphonal septum by a ∩-shaped fleshy septum, from which, on each side, a smooth, fleshy, narrow flap, as long as the septum itself, hangs down into the branchial chamber. Outside these flaps, and seated on the lateral borders of the fleshy septum, are the gills. These present some peculiar features, the most obvious of which is that the gills of the two sides are not symmetrical; and, further, that on one side, and in some cases on both sides, the plicate laminæ are discontinuous. The ctenidium of the left side is short and small, the outer lamina smaller than the inner, both dwindle to a point and cease before reaching the vertical of the visceral mass, and there is a distinct vacant space with no trace of a pendant lamina between the anterior termination of this part of the ctenidium and the sinus between the posterior parts of the palpi. Further forward, between the upper and lower palpi, a new lamina, corresponding to the inner direct and reflected lamina of the ctenidium, is developed, and attains a respectable size, being wider than the palps and extended forward, diminishing in size nearly to the front edge of the visceral mass. The right ctenidium is nearly always continuous. Its laminæ are larger than those of the left side and extend forward, diminishing in size, between the palpi to a point opposite the middle of the visceral mass. The edge of the anterior segment of the inner direct and reflected lamina of the right side is bifurcate, in front of the anterior edge of the posterior segment. The fleshy septum above described completely separates the anal and branchial chambers. The inhalent siphon opens into the latter by a circular opening capable of being closed by a sphincter muscle or arrangement of fibres. On either side, near this opening, is a large, long sensory lamina, situated on the mantle and extending forward, parallel with the thickened mantle-edge, nearly to the posterior edge of the foot, where the latter joins the visceral mass.

Type in the British Museum.

Hab.—North and South Islands, in about 5 fathoms; not common. The type was collected by the Rev. R. Taylor.

Maori.—Kuwharu (*teste* Captain Bollons).

Suborder 4. VENERACEA.

Eulamellibranchia with 2 pallial sutures; the siphons generally somewhat elongated and partially or wholly united. Gills normal, united to form a complete anal chamber. Adductor muscles subequal.

Shell-substance densely cellulo-crystalline, with inconspicuous epidermis; ligament external, parivincular, seated in a groove.

Fam. VENERIDÆ, Leach.

Animal having the mantle widely open in front for the passage of the foot, which is well developed; siphons variable in length, free or partly united, orifices distinct and fringed; foot linguiform, compressed, rarely byssiferous; adductor muscles subequal.

Valves equal, free, closed, with prosogyrous beaks, variably sculptured, with the margins more or less dentate, except in the smooth species; adductor-scars peripheral, pedal distant; pallial sinus more or less sinuated, area very distinct; resilium usually external, embraced by the ligament; hinge-plate developed, with 3 cardinals in each valve and a single obsolete lateral in one valve; the cardinals frequently bifid, usually radially disposed and subequal in size, except the posterior left one, which is often obsolete or obscure; supplementary cardinals or rugosities are present in specialized forms.

This family corresponds to the *Conques marines* of Lamarck.

Jura to Recent, the maximum in the Tertiary and later.

Subfam. 1. DOSINIINÆ.

Hinge with 3 left and 3 or 4 right cardinals, usually with an anterior left lateral fitting into a pit in the opposite valve and sometimes a developed posterior right lateral.

Siphons long and united to their tips; foot large, arcuate, without a byssus or byssal groove.

Shell usually orbicular and generally more or less compressed, with a distinct pallial sinus.

Genus 1. Dosinia, Scopoli, 1777.

Dosinia, Scopoli, Introd. Hist. Nat., 1777, 399. *Cytherea*, Bolten, 1798. *Orbiculus* β, Hegerle, 1811. *Arthemis*, Oken, 1815. *Artemis*, Conrad, 1832. *Asa*, Defrance, 1825. *Arctoë*, Risso, 1826. *Exoleta*, Brown, 1827. *Arctoa*, Herrmansen, 1846. *Cerana*, Gistel, 1848. *Assa*, Gray, 1851. *Amphithœa*, Leach, 1852. Not *Dosinia*, Gray, 1838, and P.Z.S., 1847. Type: *Dosinia africana*, Hanley.

Animal with plicated and anteriorly papillate mantle-borders; siphons very long and closely united; branchial orifice with a few sessile papillæ, anal orifice undulated; labial palpi small, triangular; gills very unequal, the outer short and appendiculate; foot large, arcuate, no trace of a byssiferous gland.

Shell orbicular, generally compressed, with a long and strong ligament seated in a groove and enfolding a heavy resilium; lunule

small, impressed; escutcheon narrow, nearly linear, or absent; hinge-plate broad and thick; right valve with 2 anterior laterals and 4 cardinals, but the posterior cardinal, being extremely thin, is often broken off, eroded, or obsolete; left valve with 1 anterior lateral and 3 cardinals; valve-margins smooth; pallial sinus rather long and usually acute, anterior lateral teeth nearly obsolete and mostly simple; sculpture generally of elegantly concentric grooves and interspaces, sometimes raised into lamellæ at the borders of the lunule and escutcheon, crossed rarely with weak radial threads; coloration rarely disposed in patterns, and usually pale, many species being white. The epidermis is nearly always thin and polished.

Distribution.—All seas.

Fossil.—Tertiary.

Sect. 1. Dosinia, s. str.

Type: *D. africana*, Hanley.

Lunule small, impressed; escutcheon narrow-elongate, flattish, bordered on each side by a ridge or keel at which the concentric sculpture tends to become lamellose; lateral tooth small, smooth; pallial sinus angular, ascending, usually narrow and elongated; valves moderately convex.

The escutcheon may be merely a flattening of the posterior dorsal border, often unequal in the two valves, or it may be a well-defined area bordered by distinct keel, more or less lamellose where the concentric sculpture intersects the carina. Between these types almost continuous gradation may be traced. (Dall.)

1. **Dosinia lambata**, Gould, 1850. Plate 62, fig. 1.

Arthemis lambata, Gould, P. Bost. S.N.H., iii, 1850, 277; U.S. Expl. Exp., xii, 422, atlas f. 536. *Artemis lambata*, Gould, Crit. List, 44. *A. laudata*, Gould: Hutton, J. de Conch., xxvi, 49. *A. lambata*, Gould, M.N.Z.M., 150. *Dosinia limbata*, Gould: Hutton, P.L.S. N.S.W., ix, 523. *D. lambata*, Gould, Chall. Rep., xiii, 151; Index, 89; Suter, T.N.Z.I., xxxix. 268. *D. Carpenteri*, Römer, Nov. Conch., Dosinia, 1862, 55, pl. 10, f. 2. *Artemis Carpenteri*, Römer, Crit. List, 44; M.N.Z.M., 150. *Cyclina Kroyeri*, Philippi, C.M.M., 72; not of Philippi.

Shell rather small, lenticular, nearly circular, subequilateral, brownish-white, very finely concentrically ribbed, somewhat shining. *Beaks* somewhat anterior, elevated, acute, much inclined forward, approximate. *Anterior end* somewhat compressed, regularly rounded, the dorsal margin excavated in front of the beaks; *posterior end* broader, more elevated, dorsal slope a little arcuate, rapidly declivous; ventral margin nearly circular, a little oblique. *Lunule* cordate, short, distinctly marked. *Escutcheon* long and narrow, limited on each side by an inconspicuous ridge. *Sculpture* consisting of very fine and dense concentric striæ, some of the ridges rising into sharp laminæ at the extremities; a faint granular appearance is produced by microscopic radiating striæ. *Epidermis* thin, somewhat shining.

Colour brownish or yellowish-white. *Interior* white, polished outside the pallial line. *Margins* smooth, sharp. *Hinge-plate* moderately broad, arcuate; right valve with 4 cardinals, the two anterior teeth subparallel, oblique, directed forwards; the third long and oblique, directed backwards, longitudinally grooved above; the fourth parallel to the latter, a fine, low, sharp lamella; 2 low divergent lateral teeth in front; left valve with 3 strong cardinals, the front tooth oblique, high, directed forwards, the other two cardinals oblique and directed backwards; the median cardinal strongest, with a tubercle and a short low arm in front; 1 short low tubercular anterior lateral tooth. *Ligament* external, extending behind from the umbones to the end of the hinge-plate. *Adductor-scars* unequal, the anterior high and narrow, the posterior suboval. *Pallial line* distinct, at some distance from the margin; pallial sinus diagonal, pointing toward the upper end of the anterior scar, acutangular, extending to the centre of the disc.

Length, 25 mm.; height, 24 mm.; diameter, 13·5 mm.

Type in the U.S. National Museum, Washington.

Hab.—Bay of Islands, type (Archer); near Channel Island, Hauraki Gulf, in 25 fathoms; Auckland Harbour; Queen Charlotte Sound, in 10 fathoms ("Challenger" Exp.); Kermadec Islands (Captain Bollons).

Fossil in the Miocene and Pliocene.

Sect. 2. Orbiculus, Megerle, 1811.

Type: *Venus exoleta*, L.

In this section there is no escutcheon, the pallial sinus is very long, and the anterior lateral is smooth and strong, otherwise it agrees with *Dosinia*, s. str. (Dall.)

2. **Dosinia cærulea**, Reeve, 1850. Plate 60, fig. 8.

Artemis cærulea, Reeve, Conch. Icon., vi, 1850, f. 25; Thes. Conch., ii, 1852, 664, pl. 142, f. 43, 44. *Dosinia cærulea*, Reeve, Nov. Conch., Dosinia, 1862, 71, pl. 13, f. 4; Suter, T.N.Z.I., xxxviii, 318.

Shell fairly large, thick and heavy, moderately convex, subquadrangularly ovate, somewhat inequilateral, with close, sharp, and strong concentric riblets, greyish-white. *Beaks* not much raised, convex, acute, approximate, directed forwards. *Anterior end* regularly convex, the dorsal margin shortly excavated in front of the umbones; *posterior end* slightly longer, narrowly rounded at the middle, the dorsal margin long, convex, descending; basal margin semicircular. *Lunule* short, cordate, striated, well impressed. *Escutcheon* indicated only by a shallow depression on each side. *Sculpture* consisting of regular, sharp, and dense concentric riblets, the sharp edges directed upwards, the interstices of the same width as the riblets. *Colour* greyish-white, the umbones light orange,

sometimes bluish. *Interior* white, porcellanous, with a few faint radial plications at the pallial line. *Margins* smooth, thick, and blunt. *Hinge-plate* strong and broad; right valve with 4 cardinals, the anterior oblique, short and thick, directed forwards; the second very stout, triangular, subvertical; the third very oblique, long, grooved above; and the fourth parallel to the latter, consisting of a low and long lamella; the 2 anterior lateral teeth distinct, short, the anterior connected with the anterior cardinal; left valve with 3 cardinals, the 2 anterior teeth diverging, connected above, Λ-shaped; the posterior cardinal on the dorsal margin, long and sharp; the anterior lateral reduced to a stout tubercle. *Ligament* deep-seated between the valves, extending from the beaks to the end of the hinge-plate; the resilium well developed. *Adductor-scars* subequal, ovate, the anterior deeper. *Pallial line* very distinct, far removed from the margin; the pallial sinus deep, ascending, narrowly triangular, its apex narrowly rounded, pointing towards the middle of the anterior scar and extending a little beyond the middle of the disc.

Length, 61 mm.; height, 55 mm.; diameter, 32 mm. Length, 52 mm.; height, 48 mm., diameter, 31 mm. (New Zealand specimen).

Type in the British Museum.

Hab.—Lyall Bay; Nelson.

The type is from Torres Strait, and the species is also recorded from Victoria.

Sect. 3. Austrodosinia, Dall, 1902.

Type: *Cytherea anus*, Philippi.

Lunule deeply impressed; escutcheon impressed and bordered by prominent keels; pallial sinus short and angular; anterior cardinals, and especially the anterior lateral, with the pit into which it is received sharply corrugated.

New Zealand and Japan.

Key to Species.

A. Shell rather coarsely concentrically ribbed; pallial sinus pointing below the anterior adductor-scar .. .. *anus.*

B. Shell with finer and closer concentric sculpture; pallial sinus pointing at the middle of the anterior adductor-scar .. *subrosea.*

3. **Dosinia anus**, Philippi, 1848. Plate 60, fig. 9.

Cytherea anus, Phil., Zeitschr. f. Malac., 1848, 132. *Artemis anus*, Phil., Conch. Icon., vi, 1850, f. 10; Thes. Conch., ii, 1852, 674, pl. 144, f. 82; Crit. List, 44; Hutton, J. de Conch., xxvi, 48. *Dosinia anus*, Phil.; Römer, Nov. Conch., Dosinia, 1862, 29, pl. 5, f. 4; C.M.M., 71. *Artemis australis*, Q. & G.: Gray, Dieff. N.Z., 1843, 249, not of Quoy and Gaimard; M.N.Z.M., 150. *Dosinia australis*, Gray: Hutton, P.L.S. N.S.W., ix, 523; Index, 89.

Shell subquadrate-orbicular, solid, compressed, concentrically sharply ribbed and laminated, very light brown, inequilateral. *Beaks* rather prominent, acute, situate at about the anterior fourth, curved

forwards, approximate. *Posterior end* regularly curved, sometimes a little straightened, the dorsal margin arcuate, high, very slowly descending; *anterior end* convex, the dorsal margin short, excavated in front of the beaks; ventral margin semicircular. *Lunule* short, cordate, lamellate, deeply impressed. *Escutcheon* long, narrow, and deep, with prominent keels. *Sculpture* consisting of concentric, elevated, rather distant, sharp ribs, which are getting convergent and lamellate at the anterior, and much more so at the posterior dorsal end; faint radiate striation is present. *Colour* light-yellowish or reddish-brown. *Interior* white, porcellanous, dull. *Margins* smooth, blunt. *Hinge-plate* broad and strong, arcuate; right valve with 4 cardinals, the anterior small, the second strong, subvertical, triangular, the third very oblique and long, and the fourth forming a fine and low lamella, subparallel to the third tooth, obsolete in adult shells; the 2 anterior lateral teeth are small, below the anterior cardinal, and much corrugated; left valve with 3 cardinals, the anterior subvertical, long, and narrow; the second very stout, oblique; and the third subparallel to the latter, long, low; the anterior lateral tooth is large, triangular, close in front of the cardinal, much corrugated. *Ligament* long and strong, extending from the umbones to within a short distance of the end of the hinge-plate; the resilium much developed. *Adductor-scars* almost equal, deep, pyriform. *Pallial line* very distinct and distant from the margin; the parallel sinus horizontal, short, and triangular, the angle pointing below the anterior adductor-scar.

Length, 49 mm.; height, 46·5 mm.; diameter, 18 mm. (type). Length, 72 mm.; height, 71 mm.; diameter, 32 mm. (large specimen).

Type of *A. australis*, Gray, in the British Museum.

Hab.—North and South Islands, but not found south of Oamaru; Kermadec Islands (Captain Bollons).

Fossil in the Pliocene.

4. **Dosinia subrosea**, Gray, 1835. Plate 60, figs. 10, *a*.

Arthemis subrosea, Gray, Yate N.Z., 1835, 309. *Artemis subrosea*, Gray: Dieff. N.Z., 249; Conch. Icon., vi, 1850, f. 19; Thes. Conch., ii, 1852, 669, pl. 143, f. 61; Crit. List, 44; Hutton, J. de Conch., xxvi, 48; M.N.Z.M., 150. *Dosinia subrosea*, Gray: Römer, Nov. Conch., Dosinia, 1862, 68, pl. 13, f. 3; C.M.M., 72; Ereb. & Ter., 6, pl. 3, f. 2; Hutton, P.L.S. N.S.W., ix, 523; Index, 89.

Shell moderately large, orbicularly ovate, inequilateral, fairly solid, closely concentrically striated, valves rather convex, light pinkish-brown. *Beaks* tumid, but little prominent, approximate, situate at about the anterior two-fifths of length, sharply pointed, and directed forwards. *Anterior end* broadly convex, the dorsal margin narrowly and deeply excavated in front of the beaks; *posterior end* straightened at the middle, narrowly rounded towards the long, curved, and rather slowly descending dorsal margin; basal margin semicircular. *Lunule* short, cordate, deep, striated. *Escutcheon* narrowly lanceolate, deep and narrow, prominently keeled. *Sculpture* consisting of close con-

centric sharp ridges, decreasing in number, and getting higher at both ends; faint radiate striæ are usually visible. *Colour* light pinkish-brown, the umbones whitish, but darker at the apices. *Interior* white, dull, the scars and borders of the margins polished, the anterior lower part with radiate fine plications. *Margins* smooth blunt. *Hinge-plate* strong, arcuate; right valve with 4 cardinals, the anterior small, vertical, and close to the much stronger triangular tooth; the third cardinal distant, horizontal, long and narrow; the fourth cardinal parallel to the former, a fine slender lamella; 2 anterior laterals, the upper one stronger, both corrugated; left valve with 3 cardinals, the anterior subvertical, thin, high, connected above by a small hook with the second, subhorizontal, stronger cardinal, forming together a broadly Λ-shaped tooth; the posterior cardinal a long slender lamella, subparallel to the median tooth; the anterior lateral forming a stout corrugated tubercle. *Ligament* strong, almost extending to the end of the hinge-plate, with a stout resilium of white colour. *Adductor-scars* subequal, pyriform. *Pallial line* distinct, distant from the margin; pallial sinus triangular, slightly ascending, extending to the middle of the disc, its angle pointing at the middle of the anterior scar.

Length, 48 mm.; height, 44 mm.; diameter, 22 mm.

Type in the British Museum.

Hab.—North and South Islands; common in the North, rare in the South. Chatham Islands. The type is from the east coast of the North Island.

Maori.—Hakari (*teste* Hutton).

Fossil.—Miocene and Pliocene.

Sect. 4. Dosinisca, Dall, 1902.

Type: *Artemis alata*, Reeve.

Areas of the lunule and escutcheon pouting mesially, defined by a pronounced sulcus, forming a posterior wing which recalls *Phacoides*; sculpture of fine, rather distant, sharp lamellæ, sometimes with radial striation; valves thin; pallial sinus deep and angular; lateral tooth entire.

This group is distributed in Australia and Japan. (Dall.)

5. Dosinia Greyi, Zittel, 1864. Plate 62, fig. 2.

Dosinia Greyi, Zittel, Reise d. "Novara," Palæontologie von Neuseeland, i, pt. 2, 1864, 45, pl. 15, f. 11. *D. Grayi*, Zittel, C. Tert. M., 22; M.N.Z.M., 151; Hutton, P.L.S. N.S.W., ix, 524 (2), i, 1887, 227; Tate, T.R.S. S.Aust., ix, 1887, 161; Plioc. M., 82; Index, 89.

Shell rather small, orbicular, thin, inequilateral, with distant sharp concentric lamellæ, the lunule raised at the middle line. *Beaks* raised, inflated, incurved and directed forwards, situate at the anterior two-fifths of length. *Anterior end* semicircular, the dorsal margin short and convex; *posterior end* broadly convex, the dorsal margin straight,

very slowly descending ; basal margin semicircular. *Lunule* vertically raised, cordiform, short, bounded by a narrow groove, finely lamellate. *Escutcheon* not defined. *Colour* light yellowish-brown. *Interior* white, dull, the scars polished. *Margins* smooth, sharp. *Hinge-plate* well developed, slightly arcuate ; right valve with 4 cardinals, the anterior short and thin, almost horizontal ; the second vertical, a little larger, triangular, and bifid ; the third long and stout, very oblique, directed backwards, deeply grooved ; and the last cardinal forming a long, slender, and low lamella close to the third tooth ; 2 anterior short lateral teeth, the upper one larger and continuous with the first cardinal ; left valve with 3 cardinals, the anterior forming an oblique narrow lamella ; the second is stout, triangular, deeply bifid, and slightly oblique ; the third is long, a sharply raised thin and very oblique lamella ; the anterior lateral tooth is well developed, of the same length as the anterior cardinal, somewhat corrugated. *Ligament* strong and rather long. *Adductor-scars* unequal, the anterior smaller, pyriform, the posterior larger, roundly ovate. *Pallial sinus* long, narrowly triangular, ascending, its angle pointing above the anterior scar.

Diameter—Ant.-post., 36 mm. ; dorso-ventral, 36 mm. : thickness, 23 mm. (type). Diameter—Ant.-post., 31 mm. ; dorso-ventral, 29 mm. : thickness, 18 mm. (Recent specimen from Evans Bay.)

Type in the K.K. Hofmuseum, Vienna.

Hab.—Auckland Harbour ; Evans Bay, Wellington Harbour (Captain Bollons) ; Banks Peninsula (Iredale) ; Stewart Island (A. Hamilton) ; Chatham Islands.

Fossil in the Miocene and Pliocene.

The late Professor Tate recorded the species found fossil in yellow limestone of the sea-cliffs at Edithburgh, on west side of St. Vincent Gulf.

Subfam. MERETRICINÆ.

Shells with smooth or concentrically sculptured surface ; generally smooth inner margins ; a single anterior lamella in the left valve, received in a pit on the opposite valve ; 3 cardinal teeth in each valve ; lunule defined by an incised line ; the escutcheon not or ill defined ; pallial sinus varying from obsolete to deep and angular.

Synopsis of Genera.

A. Shell smooth, polished	Macrocallista.
B. Shell with elevated concentric lamellæ	Cytherea.

Genus 1. Macrocallista, Meek, 1876.

Macrocallista, Meek, Pal. Upper Missouri, 1876, 179. Type : *Venus nimbosa,* Solander = *gigantea,* Gmelin. *Chione,* Gray, 1838 ; not of Megerle, 1811, or Gray, 1851. *Dione,* Gray, 1851 ; not of Hübner, 1816. *Callista,* Mörch, 1853 ; not of Leach, 1852. *Chionella,* Cossmann, 1886. *Macrocallista,* Meek : Dall, Proc. U.S. Nat. Mus., xxvi, 1902, 351 ; Trans. Wagn. Free Inst., iii, pt. 6, 1251.

Animal with the siphons of moderate length with papillose orifices, the tubes united for a great part of their length ; the margin of the

mantle largely free, more or less papillose; the foot large, hatchet-shaped, not byssiferous.

Shell ovate, solid, porcellanous, microscopically radially lineated, polished, smooth or concentrically waved, usually with a vivid coloration and vernicose periostracum; lunule definitely limited, unequally divided, the right portion slightly larger, internal margins smooth; pallial sinus ample, pointed in front; left anterior and right posterior dorsal margins grooved to receive the edge of the other valve; the anterior laterals and 3 cardinal teeth present in each valve, the right posterior cardinal more or less distinctly grooved or bifid.

Distribution.—Warm and temperate seas.

Fossil in the Tertiary.

1. **Macrocallista multistriata,** Sowerby, 1851. Plate 62. figs. 3. *a.*

Cytherea (*Callista*) *multistriata*, Sow., Thes. Conch., ii, 1851, 628, pl. 136, f. 177; Chall. Rep., xiii, pt. 35, 134, pl. 1, f. 5; Hutton, P.L.S. N.S.W., ix, 523. *Callista multistriata*, Deshayes, C.M.M., 71; M.N.Z.M., 149. *Meretrix multistriata*, Sowerby, Index, 89. *Cytherea* (*Callista*) *planatella*, Lamarck, Crit. List, 44; Hutton, J. de Conch., xxvi, 50; not of Lamarck. Not *Cytherea multistriata*, Römer, nor *Dione multistriata*, Reeve.

Shell rather small, oval, acuminate posteriorly, moderately convex, finely concentrically striated, solid, inequilateral, with pinkish-brown radiate rays, polished. *Beaks* prominent, somewhat swollen, acute, incurved and directed forwards, approximate, situate at the anterior third. *Anterior end* short, narrowly convex, the dorsal margin lightly concave and descending; *posterior end* acuminate, narrowly curved, the dorsal margin long, high, convex, descending; basal margin broadly rounded. *Lunule* moderately large, lanceolate, the right portion slightly larger. *Escutcheon* usually defined by pinkish-brown zigzag bands. *Sculpture* consisting of fine concentric striæ, the intervening ridges resembling threadlike liræ; the striæ continuous over the lunule. *Epidermis* thin, polished. *Colour* variable, usually of a buff-colour, variegated with interrupted rays and irregular wavy lines of a pinkish-brown tint, and frequently exhibiting at intervals 2 or 3 bluish concentric zones. *Interior* white, dull, but polished outside the pallial line, with a large purple patch occupying the central and upper positions of the valves, sometimes reduced to an oblique posterior radial ray. *Margins* smooth, rather blunt. *Hinge-plate* not very large, lightly arcuate; right valve with 3 cardinal teeth, the anterior tooth fairly thick, vertical, separated by a narrow groove from the second cardinal, which is a little thicker; a triangular free space separates the two teeth from the third cardinal, which is long, narrow above, and broadened below, where it is distinctly grooved; the 2 anterior lateral teeth are small, horizontal, the lower tooth longer and continued to the anterior cardinal; left valve with 3 cardinals, the anterior thin, subvertical; the second oblique and stouter; the two teeth connected above and forming a Λ-shaped tooth; the posterior cardinal long, close to and parallel with dorsal

margin of the valve; the anterior lateral in the shape of a raised tubercle. *Ligament* moderately strong, extending from the beaks to the posterior end of the hinge-plate. *Adductor-scars* unequal, the anterior oval, the posterior roundish. *Pallial line* distinct, distant from the margin; the pallial sinus rather short and broad, free, angled in front.

Length, 34 mm.; height, 24 mm.; diameter, 17 mm.

Type in the British Museum.

Hab.—Throughout New Zealand, in deep water: Bay of Islands; off Great Barrier Island, in 110 fathoms; near Channel Island, Hauraki Gulf, in 25 fathoms; Wellington (Captain Hutton); Queen Charlotte Sound, in 10 fathoms ("Challenger" Exp.); twenty-one miles north-east of Wreck Reef, in 50 fathoms; ten miles north-east of Port Adventure, in 40 fathoms (E. R. Waite); Wet Jacket Arm, Dusky Sound, in 12 fathoms; Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons); near Cuvier Island, in 38 fathoms (Captain Bollons).

Fossil in the Miocene and Pliocene.

Genus 2. Cytherea, Bolten, 1798.

Cytherea, Bolten, Mus. Bolten., 1798, 177. Types: *Venus puerpera*, L.; *V. rugosa*, Gmelin; *V. verrucosa*, L. *Gafrarium*, Bolten, 1798 (in part). *Venusarius*, Dumeril, 1806. *Dosina*, Gray, 1838; not *Dosinia*, Scopoli, 1777. *Clausina*, Brown, 1827. *Omphaloclathrum*, Mörch, 1853. *Venus*, Swainson, 1840; not of Linné and Lamarck. *Calista*, Leach, 1852; not *Callista*, Mörch, 1853. *Callista*, Fischer, 1887. *Ventricola*, Römer, 1867. *Antigona*, Römer, 1857. *Artena*, Conrad, 1870. *Cytherea*, Bolten: Dall, Proc. U.S. Nat. Mus., xxvi, 1902, 354; Trans. Wagn. Free Inst., iii. pt. 6, 1903, 1271. Type: *Venus puerpera*, L.

Shell large and rotund, valves convex, with strong sculpture in which the concentric element predominates, with well-marked lunule and escutcheon, the latter unequally divided between the valves, larger in the left valve; umbones plump; ligament set in a groove; cardinals 3 in each valve, large, the middle left and the posterior two right cardinals bifid, the left anterior lateral papilliform, obscure, sometimes obsolete; pallial line with a small, short, rounded sinus; inner margins of the valves crenulated. (Dall.)

Distribution.—Very wide.

Fossil.—Secondary and Tertiary.

Subgen. 1. Circomphalus. Mörch, 1853.

Circomphalus (sp.), Herrmansen, Ind. Gen. Mal., i, 1847, 237; Mörch, Cat. Yoldi, 1853, 23; Dall, Trans. Wagn. Free Inst., iii, pt. 6, 1273. Type: *Venus plicata*, Gmelin. *Anaitis*, Tryon, 1884; not of Duponchel, nor of Römer, 1857 (in part). *Chiona*, Römer, 1857; not of Mörch, 1853.

Shell cordate, compressed, with distant elevated reflected laminæ, more or less phyllate near the escutcheon; lunule and escutcheon impressed, sharply limited, striated, unequally divided between the

valves, smaller in the right valve ; the right portion of the escutcheon somewhat overlapping but not hiding the deeply sunken ligament ; inner margins finely crenate ; pallial sinus small, triangular ; anterior right and posterior left cardinals slender, laminar, entire, the others grooved or bifid, a minute pustular anterior lateral present in the left valve. (Dall.)

The New Zealand species assigned to this subgenus have an obscure escutcheon, and its right portion is not overlapping. They may be considered to form a distinct section.

KEY TO SPECIES.

A. Lunule short, cordate, broad .. .. *crebra.*
B. Lunule oblong, ovato-cordate.
a. Concentric lamellæ thin and sharp, erect .. .. .. *oblonga.*
b. Concentric lamellæ solid, broad, adpressed .. .. *subsulcata.*

1. Cytherea creba, Hutton, 1873. Plate 61, fig. 1.

Chione crebra, Hutton, C.M.M., 70 ; Index, 89. *Venus crebra*, Hutton, J. de Conch., xxvi, 49 ; M.N.Z.M., 147 ; P.L.S. N.S.W., ix, 522.

Shell moderately large, ovato-cordiform, subtrigonal, thick, swollen, concentrically lamellated, light brown with radiate streaks of fulvous descending from the umbones. *Beaks* approximate, swollen, turned inwards and forwards, sharply pointed, situate a little in front of the anterior fourth. *Anterior end* short, regularly convex, the dorsal margin nearly straight, rapidly descending. *Posterior end* subtruncate, the dorsal margin lightly convex, long, slowly descending, and subangled on meeting the posterior margin ; ventral margin regularly broadly rounded. *Lunule* cordate, short and broad, defined by a narrow groove, keeled at the middle, striate. *Escutcheon* ill defined, sometimes marked by oblique fulvous streaks. *Sculpture* consisting of rather distant sharp but not very high concentric lamellæ, raised somewhat near the margins, the interstices with a few fine growth-lines ; very fine radiate lines descend from the beaks, getting much more prominent on the anterior end and crenulate the concentric lamellæ. *Colour* light brown or yellowish-white, with fulvous streaks and blotches on the upper and posterior parts of the valves. *Interior* white, porcellanous, smooth, dull. *Margins* very finely crenate inside. *Hinge-plate* strong, but rather short, excavated behind the beaks ; right valve with 3 cardinals, the anterior short, fairly stout, oblique ; the second a little longer, subvertical, high, lightly grooved ; the third longer, oblique, subparallel to the dorsal margin, grooved ; a small pit in front of the cardinals ; left valve with 3 cardinals, the anterior vertical, short, solid ; the second oblique, a little longer and stouter, deeply grooved ; the third tooth almost horizontal, long and thin, sharp ; in front there is a distinct tubercular lateral tooth. *Ligament* deep, externally visible, with a strong inner resilium. *Adductor-scars*

subequal, broadly pyriform, not deep. *Pallial line* very distinct, distant from the margin; the pallial sinus short, narrow, trigonal, sharply pointed.

Length, 49 mm.; height, 45 mm. Length, 43 mm.; height, 36 mm.; diameter, 26 mm.

Type in the Dominion Museum, Wellington.

Hab.—North Island: Hauraki Gulf, Manukau Harbour.

2. Cytherea oblonga, Hanley, 1828. Plate 61, figs. 2, *a*.

Venus oblonga, Hanley, in Wood's Index Test., Suppl., 1828. *V.* (*Ventricula*) *oblonga*, Hanley, Crit. List, 44; Hutton, J. de Conch., xxvi, 49; M.N.Z.M., 147; P.L.S. N.S.W., ix, 521. *Chione oblonga*, Hanley, Index, 89. *Dosina oblonga*, Gray, Dieff. N.Z., 249; C.M.M., 69. *Venus oblonga*, Gray, Ereb. & Ter., 6, pl. 2, f. 1. *Dosina zelandica*, Gray, Yate N.Z., 309; Dieff. N.Z., 249.

Shell of moderate size, ovato-cordate, ventricose, solid, light brown, concentrically laminated, and faintly radially striated. *Beaks* prominent, swollen, sharply pointed, incurved and directed forwards, approximate. *Anterior end* shorter, occupying a little over one-fourth of the length, regularly convex, the dorsal margin short, straight, very oblique; *posterior end* sometimes lightly truncated, generally convex, the dorsal margin a little convex, slowly descending; basal margin broadly arcuate. *Lunule* large, ovate-cordate. *Escutcheon* not defined. *Sculpture* consisting of rather close, regular, slightly elevated, sharp, concentric lamellæ, higher at each end, sometimes crenulated by the usually faint radial lines. *Colour* brown or yellowish-brown, occasionally with a few radiate streaks of fulvous below the umbones. *Interior* white, porcellanous. *Margins* finely crenulated. *Hinge-plate* solid, rather short, concave below behind the beaks; right valve with 3 cardinals, like those in *C. crebra*, with a shallow pit in front; left valve also with 3 cardinals similar to those of the last species, and 1 tubercular lateral tooth. *Ligament* strong, deep-set. *Adductor-scars* subequal, large pyriform. *Pallial sinus* short, narrow, sharply pointed, triangular.

Length, 57 mm.; height, 47 mm.; diameter, 31 mm.

Type of *Dosina zelandica* and *D. oblonga*, Gray, in the British Museum.

Hab.—Throughout New Zealand, from low-water mark to about 30 fathoms. Chatham Islands.

Fossil.—Miocene and Pliocene.

3. Cytherea subsulcata, Suter, 1905. Plate 61, fig. 3.

Chione subsulcata, Suter, P. Mal. S., vi, 1905 205. *Venus sulcata*, Hutton, P.L.S. N.S.W. (2), i, 1887, 226; Plioc. M., 81, pl. 9, f. 87; not of 1875.

Shell moderately large, ovate, somewhat ventricose, with broad depressed and flattened concentric ribs and radial striæ, thick, the

umbones at about the anterior third of length. *Beaks* tumid, raised, incurved and directed forwards, sharply pointed. *Anterior end* shorter, regularly convex, the dorsal margin lightly concave, descending; *posterior end* convex, dorsal margin very little curved, oblique; ventral margin convex. *Lunule* oblong-cordate. *Escutcheon* obsolete. *Sculpture* consisting of coarse, flattish, and depressed concentric ribs, crossed by very distinct radiate striæ. *Colour* yellowish-white. *Interior* white, porcellanous. *Margins* finely crenulate. *Hinge-plate* solid, broad and rather short, concave posteriorly; right and left valve with 3 cardinals, the anterior teeth oblique, short, and thin; the median teeth subvertical, strong, grooved; the posterior teeth unequal in the two valves; in the right the tooth is oblique, long, and rather stout, grooved, in the left valve it forms an elongate long and narrow lamella; the anterior lateral tubercle obsolete. *Ligament* strong, inset, but visible on the outside, extending from the beaks to the posterior end of the hinge-plate. *Adductor-scars* subequal, oval, not deep. *Pallial sinus* short, triangular, ascending, and free.

Length, 41 mm.; height, 35 mm. (type). Length, 47 mm.; height, 41 mm.; diameter, 28 mm. Length, 39 mm.; height, 36 mm.; diameter, 26 mm.

Type, from the Pliocene, in the Canterbury Museum, Christchurch.

Hab.—Stewart Island (C. Traill); near the Snares, in 50 fathoms; Auckland Islands (Captain Bollons).

Fossil in the Pliocene.

Subfam. VENERINÆ.

Animal with comparatively short siphons, which are more or less separate from each other. The foot is hatchet-shaped and, in the adult, not byssiferous except among the nestlers. The young undergo their development outside of the parent shell.

This subfamily is characterized by the total absence of lateral teeth.

Synopsis of Genera.

A. Margins of valves crenulated; 3 cardinals in each valve; pallial sinus small, triangular; lunule well circumscribed; escutcheon not distinctly defined .. .. .. CHIONE.

B. Margins of valves smooth; 3 widely divergent cardinals in each valve; pallial sinus small, rounded; lunule long, narrow, feebly circumscribed; escutcheon not defined .. .. GOMPHINA.

C. Margins generally smooth; 3 cardinals in each valve, anterior right and posterior left entire; pallial sinus free, rather large; lunule not constant, lanceolate; escutcheon ill defined .. .. PAPHIA.

D. Margins smooth or crenulate; 3 cardinals in each valve, the anterior right and posterior left entire; pallial sinus rather large, free, blunt in front; escutcheon, if present, distinct only on the left valve .. .. VENERUPIS.

Genus 1. Chione, Megerle, 1811.

Chione, Megerle von Mühlfeld, Mag. Ges. Naturf. Freunde, Berlin, v, 1811, 51. Type: *Venus cancellata* (L.), Lamarck. *Chiona*, Mörch, 1853.

Animal having the mantle-margins plicato-dentate; siphons short, broad, unequal, united at the base, the branchial with 2 rows of cirri, the anal ciliated.

Shell ovately triangular, more or less thickened or subcordiform; margins of the valves finely crenulated. Hinge narrow, solid, with 3 cardinals in each valve. Pallial sinus small, triangular. Lunule circumscribed by an incised line; escutcheon not limited by any line, and defined chiefly by a deficiency of coarse sculpture, and a more or less pronounced ridge from the beaks towards the posterior margins. Ligament inset, visible externally. Sculpture variable, concentric ribs or lamellæ and less-prominent radials.

Distribution.—Seas of most tropical and temperate countries.

Subgen. 1. Chione, s. str.

Type: *C. cancellata*, L. *Circomphalus*, Adams, 1857. *Omphaloclathrum*, Tryon, 1884; not Mörch, 1853. Not *Chione*, Gray, 1838.

Sculpture of radial ribs decussated by concentric, sharp, elevated lamellæ; 3 cardinals in each valve, the teeth are usually entire and smooth or feebly channelled.

Sect. 1. Timoclea, Brown, 1827.

Timoclea, Brown, Ill. Conch. Gt. Brit., expl. pl. 19, f. 11. Type: *Venus ovata*, Pennant. *Pasiphaë*, Leach, 1852; not Risso, 1826. *Leukoma*, Römer, 1857. *Leucoma*, Stoliczka, 1871; not of Stephens, 1829. *Cytherea*, H. and A. Adams, 1857; not of Bolten, 1798. *Murcia* (part), Römer, 1857; not Koch, 1835.

Sculpture predominantly radial, the concentric element feeble; the middle left and 2 posterior right cardinals grooved; the escutcheon smooth. Siphons united to their orifices.

1. **Chione Stutchburyi**, Gray, 1828. Plate 61, figs. 4, *a*.

Venus Stutchburyi, Gray, in Wood's Ind. Test., Suppl., 1828, f. 4; Yate N.Z., 308; Dieff. N.Z., 250; Thes. Conch., ii, 1853, f. 50, 51; Conch. Icon., xiv, 1863, f. 59. *Chione Stutchburyi*, Gray, C.M.M., 70; Crit. List, 45; Ereb. & Ter., 6, pl. 3, f. 4; Hutton, J. de Conch., xxvi, 49; M.N.Z.M., 148; P.L.S. N.S.W., ix, 522; Index, 89; Suter, T.N.Z.I., xxxix, 269. *Venus zelandica*, Quoy and Gaimard, Voy. Astrol., iii, 1835, 522, pl. 84, f. 5, 6. *Cardita zelandica*, Potiez and Michaud, Gall. des Moll., 1838, 166. *Venus Dieffenbachi*, Gray, Dieff. N.Z., 250 (young shell); C.M.M., 70. *Chione Macleayana*, T.-Woods, P.R.S. Tas., 1879, 38.

Shell ovato-cordiform, subtrigonal, swollen, thick, radiately ribbed and concentrically ridged, fulvous. *Beaks* prominent, inflated, incurved and directed forwards, situate at about the anterior fourth of length. *Anterior end* short, rather narrowly convex, the dorsal margin straight and rapidly descending; *posterior end* convex, the

dorsal margin very long, convex, descending; basal margin broadly rounded. *Lunule* not distinctly defined, not, or only very lightly, margined. *Escutcheon* wanting. *Sculpture* consisting of low broadly rounded radiate ribs, obsolete on the posterior dorsal end, crossed by distant fine concentric ridges, which are higher on the anterior end. *Colour* reddish-brown, paler behind, or chocolate-brown. *Interior* generally bluish-white, with dark purple at the posterior end, sometimes quite white, porcellanous. *Margins* crenulated, coarsely on the posterior ventral part, much finer anteriorly. *Hinge* moderately strong, arcuate; right valve with 3 cardinals, the anterior small, vertical; the second a little oblique, strong, triangular, grooved; the posterior tooth long, horizontal, strong, and grooved; left valve with 3 cardinals, the anterior vertical, strong, triangular, and faintly grooved; the second very oblique, stout, and deeply grooved; the posterior cardinal a long and sharp thin lamella, parallel to the dorsal margin. *Ligament* very strong, deep-set, but prominently raised on the outside, with a strong internal resilium. *Adductor-scars* subequal, pyriform, the posterior slightly larger, not very much impressed. *Pallial line* distinct, distant from the margin, the pallial sinus short, broad, trigonal, free.

Length, 56 mm.; height, 49 mm. (figure in "Erebus and Terror"). Length, 47 mm.; height, 40 mm.; diameter, 29 mm. (usual size). Length, 65 mm.; height, 50 mm.; diameter, 36 mm. (specimen from the Auckland Islands).

Type in the British Museum.

Hab.—Common throughout New Zealand. Chatham and Auckland Islands. Kermadec Islands (Captain Bollons). Also Kerguelen Island.

Remarks—Specimens from brackish water are generally very small and much corroded. At the Auckland Islands the species attains a very large size, the shells are very heavy, the colour uniformly chocolate-colour, the interior white without purple markings, and the lunule is mostly quite inconspicuous. They may be considered a distinct variety.

Maori.—Huai or pipi (*teste* Hutton and Captain Bollons).

Fossil in the Miocene and Pliocene.

Sect. 2. Lirophora, Conrad, 1863.

Lirophora, Conrad, Proc. Acad. Sci. Philad. for 1862 (1863), 575, 586. Type: *Venus athleta*, Conrad; a Recent species is *V. paphia*, L. *Clausina*, Römer, 1857; not of Brown, 1827. *Anaitis* (*paphia*), Fischer, 1887; not of Tryon, 1884. *Anaitis* (part), Römer, 1857; not of Duponchel, 1829.

Sculpture of broad concentric waves, attenuated and often conspicuously lamellose distally; radially striate; ligament not covered

by the valve-margins ; the edges of the right nymph and of the left posterior cardinal with interlocking rugosities. (Dall.)

KEY TO SPECIES.

A. Shell transversely oval ; concentric lamellæ high, striate, with tubular processes, about 6 on an adult valve ; margins smooth inside .. .. *disjecta.*
B. Shell ovate, subquadrate ; concentric lamellæ not so high, laciniate, 12 to 16 on an adult valve ; margins finely crenate inside .. *Yatei.*

2. Chione disjecta, Perry, 1811. Plate 61, fig. 5.

Venus disjecta, Perry, "Conchology," 1811, pl. 58, f. 3. *Chione disjecta*, Perry : Pritchard and Gatliff, P.R.S. Vic., xvi (n.s.), 122. *Anaitis disjecta*, Perry, Index, 89. *Venus lamellata*, Lamarck, A.s.V., v, 1818, 592 ; Thes. Conch., ii, 725, pl. 160, f. 175 ; Conch. Icon., xiv, pl. 18, f. 78. *Chione lamellata*, Lamarck, C.M.M., 69 ; Hutton, J. de Conch., xxvi, 49 ; M.N.Z.M., 147.

Shell transversely oval, thin, but little inflated, with high, distant concentric lamellæ and 2 posterior ridges descending from the umbones to the lower posterior angle and to the posterior part of the ventral margin. *Beaks* not much raised, somewhat inflated, biangulate behind, incurved and directed forwards, situate at about the anterior fourth of length. *Anterior end* short, narrowly rounded, the dorsal margin a little concave ; *posterior end* truncated, subvertical, angled above towards the long, slightly convex, and very slowly descending dorsal margin ; ventral margin broadly rounded, angled on meeting the posterior margin. *Lunule* distinct, raised, radially lamellate, lanceolate. *Escutcheon* distinctly limited by a keel on each side, long and narrow. *Sculpture* consisting of distant concentric lamellæ, which are recurved, striated on the outside, and produced into semi-tubular processes on the 3 posterior ridges ; the interstices with fine growth-lines. *Colour* white, the lamellæ light-pinkish. *Interior* yellowish-white, smooth, dull. *Margins* smooth, but the upturned outer lamella very strongly crenulated. *Hinge* rather slender ; right valve with 3 cardinals, the anterior small, subvertical ; the second close and parallel to it, somewhat stouter, grooved ; the posterior cardinal horizontal, long, not very strong, grooved ; left valve with the anterior cardinal subvertical, thin, and short ; the second oblique, triangular, deeply grooved ; the third very oblique, thin, and long. *Ligament* strong, deep-set, extending from the beaks to the posterior end of the hinge-plate. *Adductor-scars* very superficial, unequal, the anterior oval, the posterior roundish. *Pallial sinus* free, moderately large, triangular, pointed in front.

Length, 58 mm. ; height, 35 mm. ; diameter, 25 mm.

Type of Lamarck in the Mus. Hist. Nat., Geneva.

Hab.—Two valves (one broken) from Cook Strait are in the Dominion Museum, Wellington. Australia and Tasmania. Found in deep water on oyster-banks (Angas).

3. Chione Yatei, Gray, 1835. Plate 60, fig. 11.

Venus Yatei, Gray, Yate N.Z., 309; Dieff. N.Z., 250; Hanley, Cat. Rec. Biv. Shells, 112; Conch. Icon., xiv, f. 84. *V. (Anaitis) Yatei*, Gray, Crit. List, 45; Ereb. & Ter., ii, 6, pl. 3, f. 11. *Chione Yatei*, Gray, C.M.M., 69; Hutton, J. de Conch., xxvi, 49; M.N.Z.M., 147. *Anaitis Yatei*, Gray, Index, 89. *Venus calcaria*, Gould, P. Bost. S.N.H., iii, 1850, 277; U.S. Expl. Exp., xii, 423. *Venus Lucasi*, Hombron and Jacquinot, Voy. P.S., Zool., v, 115, pl. 26, f. 1.

Shell ovate, subquadrate, solid, moderately convex, yellowish-brown, with thin, erect, concentric lamellæ, angled posteriorly. *Beaks* approximate, slightly raised, incurved and turned forwards, with a posterior angle. *Anterior end* short, about one-fifth of the length, narrowly convex, the dorsal margin subvertical, slightly excavated; *posterior end* truncated, the dorsal margin somewhat convex, very little descending; basal margin regularly rounded, lightly angled on meeting the posterior margin. *Lunule* long, lanceolate, laminar, the right half larger. *Escutcheon* depressed, lozenge-shaped, finely striated. *Sculpture* consisting of distant (12 to 16 on adult shells), thin, erect, concentric laminæ, wavy and laciniate on the posterior half of the valves, the interspaces with fine growth-lines and faint radiate striæ. *Colour* yellowish-brown, of a deeper, sometimes pinkish, tint anteriorly. *Interior* white, porcellanous. *Margins* finely crenulate. *Hinge*: strong, arcuate: right valve with 3 cardinals, the anterior tooth short, vertical, thin; the second longer, oblique, strong, grooved; the posterior cardinal long, horizontal, grooved; left valve with the anterior cardinal subvertical, long and narrow; the medium tooth very stout, triangular, bifid; the posterior cardinal horizontal, long and thin. *Ligament* strong, deep-set, extending from the beaks to the end of the hinge-plate. *Adductor-scars* subequal, both oval. *Pallial sinus* moderately deep, free, triangular, with a blunt apex.

Length, 55 mm.; height, 49 mm.; diameter, 27 mm.

Type in the British Museum.

Hab.—North and South Islands, but rare in the South; on sandy bottom between tide-marks and in deeper water. Kermadec Islands (Captain Bollons).

Maori.—Pukauri (*teste* Hutton).

Fossil in the Pliocene.

Sect. 3. Chamelea, Mörch, 1853.

Chamelea, Mörch, Cat. Yoldi, ii, 1853, 23. Type: *Venus gallina*, L. *Ortygia*, Brown, 1827; not Boie, 1826. *Hermione*, Leach, 1852; not Blainville, 1828. *Orthygia*, Mörch, 1853. *Chamelæa*, H. and A. Adams, 1857. *Marcia* (part), Römer, 1857; not Koch, 1835, and probably *Parrivenus* Sacco, 1900.

Sculpture of narrow, close concentric waves or low lamellæ, without distal lamellation or radial sculpture; teeth entire; ligament exposed; the escutcheon and lunule smooth. The siphons are partly united. (Dall.)

Key to Species.

A. Shell globose, the lunule broad and short, cordate .. .. *crassa.*
B. Shell compressed, lunule narrow and long, lanceolate .. .. *mesodesma.*

4. **Chione crassa**, Quoy and Gaimard, 1835. Plate 62, fig. 4.

Venus crassa, Q. & G., Voy. Astrol., iii, 1835, 525, pl. 84, f. 7, 8. *V. spissa*, Deshayes, A.s.V., ed. 2, vi, 373 (misprint for *crassa*). *V. crassa*, Q. & G., Dieff. N.Z., 250. *Chione gibbosa*, Hutton, C.M.M., 71; J. de Conch., xxvi, 49; M.N.Z.M., 148. *Venus gibbosa*, Hutt., Plioc. M., 81, pl. 9, f. 88. *C. crassa*, Q. & G.: Suter, P. Mal. S., vi, 203; E. A. Smith, *op. cit.*, 206.

Shell rather small, triangularly orbicular, globose, subequilateral, very thick, with concentric thick ribs, light brown, occasionally with 2 darker radial bands. *Beaks* approximate, slightly anterior, swollen, incurved and turned forwards, sharply pointed. *Anterior end* a little shorter, very narrowly convex, the dorsal margin very oblique and slightly concave; *posterior end* narrowly rounded, the dorsal margin descending, faintly convex; ventral margin regularly convex. *Lunule* large, ovate, striated. *Escutcheon* slightly excavated, narrow, finely striated. *Sculpture* consisting of numerous rather broad, depressed concentric ribs, with a sharp upper edge and finely concentrically striated, the interstices very narrow; faint dense radiate striæ are generally present. *Colour* whitish, yellowish-white, or light brown, sometimes with 2 darker radial bands descending from the umbo to the middle and posterior part of the ventral margin. *Interior* white, bordered by dark violet. *Margins* finely crenulated. *Hinge* strong, broad, short; right valve with 3 cardinals, the anterior lamellar, oblique; the median vertical, the posterior oblique, both moderately strong; left valve also with 3 cardinals, the median slightly grooved, the posterior tooth long, thin, and very oblique. *Ligament* narrow and short, inset. *Adductor-scars* almost equal, ovate. *Pallial sinus* short, triangular, free, and ascending.

Length, 27 mm.; height, 24·75 mm.; diameter, 18 mm. (type).

Type in the Mus. Hist. Nat., Paris.

Hab.—Preservation Inlet; Stewart Island, in 18 fathoms; off Wreck Reef, in 65 fathoms; Auckland Islands (Captain Bollons).

Remarks.—This species does not represent old and thickened shells of *C. mesodesma*, for in young shells the proportion between length and diameter is about the same as in adult shells. The form of the lunule is always different in the two species.

Fossil in the Pliocene.

5. **Chione mesodesma**, Quoy and Gaimard, 1835. Plate 62, fig. 5.

Venus mesodesma, Q. & G., Voy. Astrol., iii, 1835, 532, pl. 84, f. 17, 18: Dieff. N.Z., 251; Hutton, P.L.S. N.S.W., ix, 523. *Chione mesodesma*, Q. & G., C.M.M., 70; J. de Conch., xxvi, 49; M.N.Z.M., 148; Chall. Rep., xiii, 131; Suter, P. Mal. S., vi, 204. *Venus crassa*, Q. & G.: Suter, T.N.Z.I., xxxiv, 221; not of Q. & G. *Chione crassa*, Q. & G., Index, 39; not of Q. & G. *? Venus spurca*, Sowerby, P.Z.S., 1835, 23; Thes. Conch., ii, f. 92–97; Conch. Icon., xiv, f. 90. *Murcia scansitis*, Römer, Mal. Blätt., vii, 1860, 161.

Shell small, oval, subtrigonal, rather compressed, subequilateral, concentrically closely ribbed, whitish with radial bands or zigzag lines

of brown. *Beaks* not much raised, tumid, approximate, incurved and turned forwards, sharply pointed. *Anterior end* very little shorter, narrowly convex, the dorsal margin a little excavated and slowly descending; *posterior end* subtruncate, the dorsal margin long, lightly convex, slowly descending; basal margin broadly rounded. *Lunule* narrow, lanceolate. *Escutcheon* narrow, concave, finely striate. *Sculpture* consisting of equal narrow and flat concentric riblets with linear interstices, on the posterior end two ribs usually merge into one stronger and slightly raised rib; radial striation is but faintly indicated. *Colour* whitish or light brown, generally with a few radiate bands of darker brown, or variably and often beautifully ornamented with zigzag lines. *Interior* bluish-white in the centre, more or less violet round the margins. *Margins* finely crenulate. *Hinge* strong but short; right valve with 3 divergent cardinals, the anterior feeble, the two others stronger and lightly grooved; left valve with the 3 diverging cardinals nearly of equal strength, the posterior tooth longest and a little thinner, the median tooth a little grooved. *Ligament* moderately strong, short, deep. *Adductor-scars* subequal, the anterior oval, the posterior roundish. *Pallial sinus* very short, triangular, free, ascending.

Length, 20·25 mm.; height, 15·75 mm.; diameter, 9 mm. (type).

Type in the Mus. Hist. Nat., Paris.

Hab.—Throughout New Zealand, from the shore to about 50 fathoms; more abundant in the north. Auckland Islands; Kermadec Islands (Captain Bollons). Tristan da Cunha, in 1,000 fathoms ("Challenger" Exp.).

Fossil.—Miocene and Pliocene.

Subsp. **violacea**, Quoy and Gaimard, 1835.

Venus violacea, Q. & G., Voy. Astrol., iii, 1835, 533, pl. 84, f. 19, 20. *Chione mesodesma violacea*, Q. & G.: Suter, P. Mal. S., vi, 204.

The shell is small, much compressed, subequilateral; the lunule shorter than in the species, but of about the same width; the colour is a reddish-violet, the beaks reddish, with 2 rays of green with white spots descending from the beaks, one nearly vertical, the other ending at the posterior end of the ventral margin.

Length, 15·75 mm.; height, 12·25 mm.; diameter, 6·75 mm. (type).

Type in the Mus. Hist. Nat., Paris.

Hab.—New Zealand (Q. & G.); Tiri-Tiri Island (H. S.).

Genus 2. Gomphina, Mörch, 1853.

Gomphina, Mörch, Cat. Yoldi, ii, 1853, 19. Type: *Venus donacina*, Chem. *Gomphina*, Dall, Trans. Wagn. Free Inst., iii, pt. 6, 1289; Jukes-Browne, P. Mal. S., viii, 243.

Shell trigonal, rather thick, compressed, smooth or concentrically striated. Lunule long, narrow, superficial, and feebly circumscribed;

escutcheon not defined; ligament very short. Margins of valves smooth; dorsal margin of both valves grooved on both sides of the hinge-plate to receive the opposing edges. Pallial sinus small and rounded. Hinge-plate short, broad from the umbo inwards, triangular. Teeth: 3 cardinals in each valve; rather long, straight, separate, widely and equally divergent. In the right valve the median is broad and triangular, generally solid, the posterior narrow and feebly grooved. In the left valve the anterior is very long, the median thick and feebly grooved, the posterior very thin. The left anterior and the right median are sometimes feebly grooved.

Distribution.—Western Pacific, ranging from Australasia to Japan.

1. Gomphina maorum, E. A. Smith, 1902. Plate 63, fig. 15.

Gomphina maorum, Smith, J. Mal., ix, 1902, 109, figs. in text.

Shell small, equivalve, inequilateral, fairly solid, ovate-trigonal, moderately convex, white with 2 fuscous radial rays and zigzag lines. *Beaks* not very prominent, contiguous, post-median, incurved, very slightly directed forwards. *Anterior end* longer, acutely rounded, the dorsal margin long, a little curved, slowly descending; *posterior end* convex, the dorsal margin arcuate, descending; ventral margin broadly rounded. *Lunule* and *escutcheon* not defined. *Sculpture* consisting of irregular strong concentric striæ. *Colour:* 2 brown or reddish radial rays, one down the middle of the valves, and the other posterior to it; the rest of the surface marked with irregular wavy zigzag lines, always reddish towards the umbones. *Interior* white, sometimes reddish, with faint radiate striæ at the pallial line. *Margins* smooth, sharp. *Hinge:* Right valve with 3 diverging cardinals, the median tooth strongest, triangular; left valve with the same number and arrangement of the cardinals, the median triangular and lightly grooved; dorsal margins grooved. *Ligament* short. *Adductor-scars* subequal, the anterior ovate, the posterior roundish. *Pallial sinus* small, broad, not deep, convex.

Length, 16 mm.; height, 13 mm.; diameter, 8 mm. (type).

Type in the British Museum.

Hab.—Cape Maria van Diemen (McGahey).

Genus 3. Paphia, Bolten, 1798.

Paphia, Bolten, Mus. Bolten., 1798, 175; not of Lamarck, 1799 and 1801, or Fabricius, 1808, or Oken, 1815. Type: *P. ala-papilionis*, Bolten (after Chemnitz). *Tapes*, Megerle von Mühlfeld, 1811.

Animal with the borders of the mantle smooth; siphons moderately long, separated to some extent, papillate; foot large, compressed, pointed, grooved, and byssiferous; palpi triangular, elongated; gills unequal.

Shell elongate-oval, subcompressed, rather solid, with close concentric riblets; lunule not constant, lanceolate; inner margins

generally smooth ; pallial sinus free, narrow ; hinge with 3 cardinals in each valve, the anterior right and posterior left cardinals entire, the others often bifid.

Distribution.—European seas, Senegal, Brazil, Indian Ocean, China, Australasia, &c.

Fossil.—Cretaceous and Tertiary.

Vernacular Name.—Carpet-shell.

KEY TO SUBGENERA.

A. Sculpture not divided into areas, reticulate ; internal margins smooth ; pallial sinus rounded in front ; all cardinals more or less bifid .. .. RUDITAPES.

B. Sculpture divided into 3 areas, the middle being chiefly radial ; internal margins sharply crenulated ; pallial sinus pointed in front ; the middle cardinals usually bifid or grooved .. PROTOTHACA.

Subgen. 1. RUDITAPES, Chiamenti, 1900.

Ruditapes, Chiamenti, Revista Ital. Sci. Nat., xx, 1900, 13. Type ; *Venus decussata*, L. *Amygdala*, Römer, 1864 ; not of van Phelsum, 1774, nor *Amygdalum*, Megerle, 1811. *Cuneus*, H. and A. Adams, 1857 ; not of Da Costa.

Animal with the siphons wholly free from each other ; the foot byssiferous.

Valves convex, oblong ; surface dull and feebly coloured ; sculpture strong distally, more or less reticulate, the concentric ridges more or less inosculating anteriorly and feeble on the middle of the shell, the radial sculpture stronger ; internal margins smooth ; the pallial sinus horizontal, large, free below, rounded in front ; the lunule circumscribed, the escutcheon feebly defined ; all the inner cardinals more or less bifid. (Dall.)

KEY TO SPECIES.

A. Shell small, thin and fragile, radial lines inconspicuous, uniformly white, median cardinals grooved, interior white .. .. *fabagella.*

B. Shell moderately large, solid, radial lines distinct, yellowish-white, young shells with radial zigzag markings, the 2 posterior right and the left median cardinals grooved, inside often violet posteriorly .. .. *intermedia.*

1. Paphia fabagella, Deshayes, 1854. Plate 55, figs. 1, *a*, *b*.

Tapes fabagella, Desh., P.Z.S., 1853 (1854), 10 ; Conch. Icon., xiv, pl. 13, f. 66 ; Römer, Monogr. Gen. Venus, 91, pl. 31, f. 2 ; C.M.M., 72 ; Crit. List, 46 ; M.N.Z.M., 151 ; Chall. Rep., xiii, 116 ; Hedley, Rec. A.M., v, 89 ; Suter, T.N.Z.I., xxxviii, 318. *T. reticulata*, T.-Woods, P.R.S. Tas., 1876, 159.

Shell oblong-ovate, thin and fragile, tumid, very inequilateral, rather compressed, finely reticulated, white. *Beaks* at about the anterior fifth of length, very little raised, acute, directed forwards. *Anterior end* shorter, very narrowly rounded, the dorsal margin

straight, slowly descending; *posterior end* broader, obliquely truncated, the dorsal margin straight and very little inclined; ventral margin straight or lightly curved, rounded at both ends. *Lunule* ovato-lanceolate, superficial, not distinct. *Escutcheon* not well defined, slightly impressed. *Sculpture* consisting of fine concentric striæ, much fewer and lamellate at the posterior end, front and middle finely radiately striated. *Colour* white, sometimes yellowish-brown. *Interior* white, smooth, shining. *Margins* smooth, sharp. *Hinge* with 3 cardinals in each valve, of nearly equal strength, oblique and slightly divergent, the median tooth in each valve grooved. *Ligament* long and thin. *Adductor-scars* subequal, the anterior more pyriform. *Pallial sinus* extending to the middle, free, narrowing slowly, rounded in front.

Length, 21 mm.; height, 13 mm.; diameter, 8·6 mm.

Type in the British Museum.

Hab.—New Zealand (Cuming): Cook Strait; Stewart Island. Also Australia and Tasmania.

2. Paphia intermedia, Quoy and Gaimard, 1835. Plate 61, figs. 6, *a*.

Venus intermedia, Q. & G., Voy. Astrol., iii, 1835, 526, pl. 84, f. 9, 10; Hanley, Cat. Rec. Biv. Shells, 127, pl. 16, f. 41; Thes. Conch., ii, 692, pl. 146, f. 39; Yate N.Z., 308; Dieff. N.Z., 250. *Tapes intermedia*, Q. & G., Conch. Icon., xiv, f. 59; Römer, Monogr. Gen. Venus, 82, pl. 29, f. 2; C.M.M., 72; Crit. List, 45; M.N.Z.M., 151; P.L.S. N.S.W., ix, 524; Chall. Rep., xiii, 116; Index, 89. *Venus Largillierti*, Phil., Zeitsch. f. Malak., 1847, 87; Abbild., iii, 60, pl. 9, f. 3.

Shell moderately large, ovate, transverse, solid, very inequilateral, subtruncated posteriorly, concentrically and radially striated. *Beaks* at about the anterior fifth of length, approximate, incurved and turned forwards. *Anterior end* short, convex, the dorsal margin rapidly descending; *posterior end* subtruncated, high, the dorsal margin horizontal, curved towards the posterior end; basal margin broadly rounded. *Lunule* not distinctly circumscribed, flat, ovato-lanceolate. *Escutcheon* long and narrow, slightly excavated. *Sculpture* consisting of fine concentric striæ, coarser and lamellar at the ventral and posterior parts of the valves, where several riblets of the median part are united to one broader lamella; the concentric riblets are decussated by fine radiate striæ, less prominent on the posterior end. *Colour* brownish or yellowish-white, young shells mostly with radial zigzag lines of brown. *Interior* white, more or less marked with violet at the posterior end, porcellanous, dull. *Margins* smooth. *Hinge-plate* narrow; right valve with 3 diverging cardinals, the two posterior teeth grooved, the anterior tooth small, sometimes obsolete in adult shells; left valve with the 3 cardinals more distant, the median tooth stout and deeply grooved, the others much smaller, laminar, not grooved. *Ligament* moderately long, strong. *Adductor-scars* subequal, the posterior more oval. *Pallial*

line very distinct, distant from the margin, the *sinus* free, horizontal, oval-linguiform, rounded in front.

Length, 57 mm. ; height, 41 mm. ; diameter, 27·5 mm.

Type in the Mus. Hist. Nat., Paris.

Hab. — Throughout New Zealand, common. Auckland and Campbell Islands.

Remarks.—Specimens from the Auckland Islands are brown, very large and solid.

Maori.—Hakari (*teste* Hutton).

Fossil.—Miocene and Pliocene.

Subgen. 2. PROTOTHACA, Dall, 1902.

Protothaca, Dall, Proc. U.S. Nat. Mus., xxvi, 1902, 364 ; Trans. Wagn. Free Inst., iii, pt. 6, 1326. Type : *Venus thaca*, Molina.

Shell ovate, moderately convex ; coloration usually whitish or dull ; surface not polished, reticulately sculptured, the radials usually stronger ; sculpture more or less distinctly divided into 3 areas, the middle of the valves being chiefly radial, the anterior radial and scabrous, the posterior irregularly concentric ; the lunule is sharply circumscribed, also the escutcheon of the left valve ; the right valve in the type has no corresponding portion of the escutcheon, and the margin somewhat overlaps that of the left valve, but does not conceal the ligament ; the middle cardinals are usually grooved or bifid ; the pallial sinus of moderate size, nearly horizontal, free below and pointed in front ; the inner margins are sharply crenulated.

The siphons are short, united, and only the incurrent orifice is papillose ; the foot is hatchet-shaped and not byssiferous. (Dall.)

Distribution.—West coast of South America, Japan, and New Zealand.

3. Paphia costata, Quoy and Gaimard, 1835. Plate 61, fig. 7.

Venus costata, Q. & G., Voy. Astrol., iii, 1835, 521, pl. 84, f. 1, 2 ; Crit. List, 45 ; Hutton, P.L.S. N.S.W., ix, 522. *Chione costata*, Q. & G., C.M.M., 70 ; J. de Conch., xxvi, 49 ; M.N.Z.M., 148 ; Index, 89. *Venus crassicosta*, Quoy : Hanley, Cat. Rec. Biv. Shells, 118, pl. 16, f. 39 ; Conch. Icon., xiv, f. 42. *Tapes crassicosta*, Quoy, Thes Conch., ii, f. 93.

Shell moderately large, transversely ovate, inequilateral, rather thick, yellowish-white, with broad radial ribs and concentric grooves. *Beaks* contiguous, not much raised, inflated, sharply pointed, incurved and directed forwards. *Anterior end* short, rounded, the dorsal margin curved and rapidly descending ; *posterior end* broadly subtruncated, the dorsal margin straight, slowly descending ; ventral margin very little rounded. *Lunule* distinctly circumscribed, lanceolate, obliquely striated. *Escutcheon* indistinct. *Sculpture* consisting of broad, flattish radial ribs, much broader at the posterior end ; crossed by concentric striæ, which are faint on the middle part, numerous and lamellate anteriorly, and distant posteriorly. *Colour*

yellowish-white. *Interior* white, the posterior and sometimes the upper part dark violet. *Margins* finely crenulate. *Hinge-plate* moderately strong; right valve with 3 cardinals, the anterior thin, the others strong and grooved; left valve with the posterior cardinal slender, the 2 anterior teeth stronger and grooved. *Ligament* strong, moderately long. *Adductor-scars* unequal, the anterior scar oval, deep, the posterior broadly pyriform, less deep. *Pallial* sinus rather short, triangular, narrowly rounded in front.

Length, 38 mm.; height, 32 mm.; diameter, 20 mm. (type). Length, 46 mm.; height, 36 mm.; diameter, 24 mm.

Type in the Mus. Hist. Nat., Paris.

Hab.—Throughout New Zealand, but not common.

Maori.—Tuangi (*teste* Captain Bollons).

Genus 4. Venerupis, Lamarck, 1818.

Venerupis, Lamarck, A.s.V., v, 1818, 506. Type: *V. irus*, L. *Pullastra*, Sowerby, Gen. Shells, 1826. *Rupellaria*, H. and A. Adams, 1857; not of Fleuriau, 1802. *Irus*, Herrmansen, 1847; not of Oken, 1815.

Animal having long siphons, with papillose orifices, united for about half their length; foot grooved and byssiferous.

The valves are moderately elongate and subquadrate. The sculpture is radial, with prominent rather distant concentric lamellation. There is no lunule; and an area bounded by a keel, in the left valve only, represents what may be called the escutcheon. The ligament is exposed; the pallial sinus short, ascending, free and blunt in front; the internal margins are smooth in the type. The nepionic shell is polished and coloured, the adult dull and rude. Hinge with 3 cardinals in each valve; the anterior right and posterior left cardinals are entire and slender, the others broad and deeply bifid. (Dall.)

The species of the group are nestlers in rock-cavities, by reason of which they are frequently deformed and abnormal.

Distribution.—Seas of Europe, Indian Ocean, Philippines, California, Australasia.

Fossil.—Secondary and Tertiary.

Key to Species.

A. Shell with very distinct radial striation; margins crenate; a lunule present .. .. *elegans.*

B. Shell with faint radial striation.

a. No escutcheon; concentric lamellæ not anastomosing .. *reflexa.*

b. A narrow deep escutcheon on left valve; concentric lamellæ anastomosing more or less .. .. *siliqua.*

1. Venerupis elegans, Deshayes, 1854. Plate 62, figs. 6, *a*.

Venerupis elegans, Desh., P.Z.S., 1853 (1854), 5, pl. 18, f. 2; Crit. List, 46; Ereb. & Ter., 6, pl. 2, f. 6; Hutton, J. de Conch., xxvi, 50; M.N.Z.M., 152; P.L.S. N.S.W., ix, 524; Index, 90.

Shell rather small, elongated, transverse, narrow, inequilateral, inflato-cylindrical, distinctly radially striate and distantly con-

centrically lamellate, light brown. *Beaks* contiguous, not raised, flattish, incurved and directed forwards. *Anterior end* short, occupying about a quarter of the length, attenuated and very narrowly rounded, dorsal margin straight, slowly descending; *posterior end* truncated, the dorsal margin long, straight, almost horizontal; ventral margin very broadly rounded. *Lunule* fairly distinct, lanceolate, not much impressed. *Escutcheon* long, narrow, deep, distinct only on the left valve. *Sculpture* consisting of very fine and elegantly granular radiate striæ and rather distant unequal lamellæ, obtuse in front, crenulated, behind finer and broader, minutely crisped. *Colour* light yellowish-brown. *Interior* white, the posterior end sometimes purple. *Margins* finely crenulated. *Hinge* narrow, each valve with 3 diverging cardinals, the anterior right and posterior left entire and slender, the others stout and grooved. *Ligament* rather short, external. *Adductor-scars* subequal, not deep. *Pallial sinus* moderate, triangular, free and ascending, pointed in front.

Length, 38 mm.; height, 20 mm.; diameter, 19 mm.

Type in the British Museum.

Hab.—Northern part of the North Island: Auckland Harbour; Whangarei Heads. &c. Boring in soft rock.

2. Venerupis reflexa, Gray, 1843. Plate 62, fig. 7.

Venerupis reflexa, Gray, Dieff. N.Z., 250; C.M.M., 73; Crit. List, 46; Ereb. & Ter., 6, pl. 2, f. 3; Hutton, J. de Conch., xxvi, 50; M.N.Z.M., 152; P.L.S. N.S.W., ix, 524; Index, 90. *V. paupercula*, Deshayes, P.Z.S., 1853 (1854), 5; M.N.Z.M., 152.

Shell ovate to oblong, very irregular, somewhat inflated, fairly solid, inequilateral, irregularly concentrically laminated, yellowish-white. *Beaks* approximate, tumid, incurved and bent forwards. *Anterior end* short, rounded, the short dorsal margin lightly excavated, descending; *posterior end* truncated or broadly rounded, dorsal margin straight, very little oblique; basal margin moderately arcuate. There is neither *lunule* nor *escutcheon*. *Sculpture* consisting of thin, sharp-edged, reflexed, concentric ridges, sometimes very irregularly arranged, highest and most bent over and back at the hinder edge, the interspaces with 2 or 3 lower concentric ridges and faint radiate striæ. *Colour* dirty-yellowish or brownish-white. *Interior* yellowish-white, frequently marked with violet behind. *Margins* smooth. *Hinge* narrow, each valve with 3 cardinals; in the right valve the anterior and posterior tooth are small, the median tooth large, triangular, grooved; in the left valve the posterior cardinal is entire and thin, the others stouter and grooved. *Ligament* short, rather thick. *Adductor-scars* large, not much impressed, the anterior scar oval, the posterior roundish and slightly larger. *Pallial sinus* free, nearly horizontal, broad and deep, rounded in front.

Length, 28 mm.; height, 21 mm.; diameter, 17 mm.

Type in the British Museum.

Hab.—North and South Islands, but more common in the North. Chatham Islands.

3. Venerupis siliqua, Deshayes, 1854. Plate 62, fig. 8.

Venerupis siliqua, Desh., P.Z.S., 1853 (1854), 5, pl. 18, f. 1; Crit. List, 46; M.N.Z.M., 152; Index, 90.

Shell rather small, elongate, transverse, somewhat inflated, inequilateral, unequally concentrically striated, yellowish-white. *Beaks* approximate, situate at the anterior fourth of length, not much raised, tumid, with an obtuse posterior angle, turned forwards. *Anterior end* short, rounded, the dorsal margin slightly excavated and descending; *posterior end* truncated, angled above towards the straight horizontal dorsal margin; basal margin broadly convex. There is no *lunule*. *Escutcheon* long, deep, and narrow, on the left valve only. *Sculpture* consisting of unequal, concentric, irregular lamellæ, larger and higher behind, more or less anastomosing on the sides; radial striæ in the interspaces feebly indicated, crossing the interstitial fine concentric threads. *Colour* dirty yellowish-white. *Interior* yellowish-white, the posterior part sometimes purple. *Margins* smooth. *Hinge* narrow, 3 cardinals in each valve, the anterior tooth in the right valve slender, entire, the others strong, grooved; in the left valve the posterior cardinal tooth a long, slender, and very oblique lamella, the middle tooth strongest, triangular, bifid, the anterior tooth fairly strong, entire or slightly grooved. *Ligament* short and stout. *Adductor-scars* unequal, the anterior smaller, ovate, the posterior round. *Pallial sinus* linguiform, extending to the middle of the valves, narrowly rounded in front.

Length, 26 mm.; height, 15 mm.; diameter, 10 mm.

Type in the British Museum.

Hab.—New Zealand (Cuming): Hohoura Bay; Hauraki Gulf; Manukau Harbour; Gisborne.

Suborder 5. CARDIACEA.

Eulamellibranchia with 2 pallial sutures. Generally with short siphons. The foot cylindrical, more or less elongated, furnished with a byssogenous apparatus. The gills much folded.

Shell equivalve, with radiating costæ, external ligament, and conical cardinal teeth, the lateral laminæ short, distant.

Fam. CARDIIDÆ, Gray.

Animal with the mantle slightly closed; siphons very short, and surrounded by a single circle of papillæ, which are often oculiferous. Foot very long, geniculated.

Shell-substance cellulo-crystalline, with the external layer more or less tubular; valves equal, free, gaping slightly behind, the beaks

prosocœlous, the margins usually serrate or radially striated; adductor-scar subequal, the pedal distinct and usually distant; ligament and resilium parivincular, external, short, set in a groove; area obscure; complete hinge consisting of an anterior and posterior lateral in the left and 2 anterior and 1 posterior lateral in the right valve, any or all of which may be absent; 2 cardinal teeth in each valve, the teeth simple, smooth, never bifid; 1 cardinal in each valve usually persistent, the other inconstant.

Trias to Recent.

Genus 1. Protocardia, Beyrich, 1845.

Protocardia, Beyrich, Zeitschr. f. Malak., 1845, 17. Type: *Cardium hillanum*, Sowerby (Cretaceous).

Shell globose; umbones elevated, incurved, and slightly inclined anteriorly; posterior area sharply distinguished by sculpture from the rest of the surface; right valve with 1 or 2 cardinal teeth, 2 anterior lateral teeth, and 1 or 2 posterior lateral teeth; left valve, 2 cardinal teeth, 1 anterior lateral tooth, and 1 posterior lateral; ligament external; pallial line entire.

The genus is circumtropical.

Sect. 1. Nemocardium, Meek, 1876.

Nemocardium, Meek, Pal. Upper Missouri, 1876, 172. Type: *Cardium semiasperum*, Deshayes.

The posterior area spinose or tuberculate, the remainder of the surface finely radially striate, or finely reticulate; the anterior laterals springing from the umbonal cavity.

1. Protocardia pulchella, Gray, 1843. Plate 62, fig. 9.

Cardium pulchellum, Gray, Dieff. N.Z., 252; Conch. Icon., ii, 1844, pl. 8, f. 42; Crit. List, 46. *C. (Bucardium) pulchellum*, Gray, Chall. Rep., xiii, 161; Suter, T.N.Z.I., xxxiv, 222; Hedley, *op. cit.*, xxxviii, 75. *Protocardia (Nemocardium) pulchella*, Gray: Suter, T.N.Z.I., xxxix, 260; xl, 358. *Cardium striatulum*, Sowerby, P.Z.S., 1840, 105, not of Brocchi: Conch. Illustr., 1841, sp. 9, pl. 49, f. 16; pl. 177, f. 45: Hanley, Cat. Rec. Biv. Shells, 135, 363, pl. 17, f. 9: Conch. Icon., ii, 1844, pl. 86, f. 60: C.M.M., 73: Crit. List, 46: M.N.Z.M., 153: Hedley, Mem. A.M., iv, 322. *C. pulchellum*, Gray: Pritchard and Gatliff, P.R.S. Vic., xvi (n.s.), 136.

Shell small, subcordate, somewhat oblique, rather ventricose, inequilateral, thin, finely radially striate, pale fulvous with pink striped bands. *Beaks* raised, convex, faintly biangulate, a little excavated in front, contiguous, the sharp points incurved and slightly turned forwards. *Anterior end* shorter, regularly convex; *posterior end* truncated, the dorsal margin gently sloping, ventral margin broadly rounded. *Sculpture* consisting of very fine and dense, regular, rounded radial riblets, the interstices of the same width as the ribs, crossed by very fine, wavy, and anastomosing concentric threads, raised into short spines on the riblets of the posterior part of the

valves. *Colour* pale fulvous or pinkish-white, with radial bands of pink, which become obsolete by age. *Interior* yellow at the upper central part, pink on the anterior and posterior upper ends and also on the hinge-plate, white and shining at the ventral part of the valves. *Margins* finely denticulated by the radial sculpture. *Hinge-plate* very narrow, arcuate; right valve with 1 conical cardinal and a second minute cardinal in front of it, 1 anterior and 2 posterior lateral teeth, the former arising from the umbonal cavity, and having sometimes a second obsolete lamella above; left valve with 2 cardinals, the anterior tooth larger, erect, the posterior at some distance and small; 1 anterior and 1 posterior lateral. *Ligament* short, external. *Adductor-scars* subequal, ovate. *Pallial line* indistinct, entire.

Length, 27 mm.; height, 22 mm.; diameter, 17 mm.

Type in the British Museum.

Hab.—North and South Islands and Stewart Island, in depths varying from a few to 100 fathoms. Off Great Barrier Island, in 110 fathoms; near Cuvier Island, in 38 fathoms; Hauraki Gulf, in 25 fathoms; off Wanganui, in 20 fathoms; Queen Charlotte Sound, in 16 fathoms; off Oamaru, in 40 fathoms; Molyneux Bay, in 20–46 fathoms; north-east of Wreck Reef, in 50 fathoms; Wet Jacket Arm, in 12 fathoms; Preservation Inlet; Stewart Island, in 15–20 fathoms; Milford Sound, in 100–120 fathoms (Professor Chilton). Australia and Tasmania.

Fossil.—Miocene and Pliocene.

Suborder 6. MYACEA.

Eulamellibranchia in which the mantle is closed to a considerable extent; the siphons are well developed, the gills much folded and frequently prolonged into the branchial siphon. The foot is compressed, and generally byssiferous. The shell gaping, with a pallial sinus.

Fam. **PSAMMOBIIDÆ**, Gray.

Animal with the siphons very long and quite separate; foot large, flattened from side to side, and pointed.

Shell as in the *Tellinidæ*, but usually more equivalve and less twisted, with more conspicuous epidermis and nymphs, broader hinge-plate, and a wider posterior gape; lateral laminæ on the hinge wanting, and the cardinals sometimes 3 in the valve; ligament external and conspicuous; no defined area.

Tertiary to Recent.

Synopsis of Genera.

A. Right valve with 2, left valve mostly with 1, strong grooved or bifid cardinals; pallial sinus deep, but not extending far beyond the vertical of the beak .. .. .. Psammobia.

B. Two cardinals in each valve, erect, small, not grooved; pallial sinus extending much beyond the vertical of the beak .. Soletellina.

Genus 1. Psammobia (Lam.), Bowdich, 1822.

Psammobia, Lamarck, A.s.V., v, 1818, 511; Bowdich, Elem. Conch., ii, 1822, 6, pl. 1, f. 10. Type: *P. ferŏensis*, Gmelin. *Gari*, Schumacher, 1817 (in part). *Haplomochlia*, Gistel, 1848.

Animal with very long and slender siphons, longitudinally ciliated, the orifices papillose; foot large, linguiform, and pointed; palpi long and subulate; gills unequal, the outer smaller than the inner. Anatomy of *P. pallida*: S. P. Woodward, A.M.N.H. (2), xv, 1855, 99, with figs.

Shell transversely elongated, subequilateral; anterior margin rounded; posterior margin usually subtruncate and angulate; normal formula of teeth—right valve with 2, left valve with 3 cardinals, but this is almost always reduced until the left valve may have but 2 and the right 1 tooth. Pallial sinus large.

Distribution.—About 100 species from all seas are known, from below low-water mark to about 50 fathoms.

Fossil in the Tertiary.

Vernacular Name.—Sunset-shell.

Key to Subgenera.

A. Shell elongated, compressed, pointed behind, posterior dorsal area more or less defined .. .. .. Psammobia, s. str.
B. Shell blunt in form, inflated, truncate behind, posterior dorsal area not circumscribed .. .. .. Gobræus.

Subgen. 1. Psammobia, s. str.

Shell elongated, more or less pointed behind, compressed, somewhat rudely concentrically sculptured, the posterior dorsal area frequently sculptured diversely from the disc, the pallial sinus elongated and for the most part coalescent below with the pallial line.

1. Psammobia lineolata, Gray, 1835. Plate 61, fig. 8.

Psammobia lineolata, Gray, Yate N.Z., 309; Dieff. N.Z., 253; Hanley, Cat. Rec. Biv. Shells, 59, 346, pl. 14, f. 1; C.M.M., 66; Crit. List, 42; Conch. Icon., x, f. 58; Ereb. & Ter., 5, pl. 2, f. 11; M.N.Z.M., 142; Hutton, P.L.S. N.S.W., ix, 520; Chall. Rep., xiii, 92. *P. convexa*, Reeve, Conch. Icon., x, f. 59.

Shell oblong, transverse, compressed, subequilateral, thin, smooth, shining, concentrically banded with purplish-pink and radially rayed with white. *Beaks* approximate, not raised, small and inconspicuous. *Anterior end* very little shorter than the posterior, narrowly rounded, the dorsal margin almost straight, very little descending; *posterior end* bluntly angled a little below the middle, convexly ascending towards the straight dorsal margin; ventral margin very broadly rounded. *Lunular area* narrowly excavated. *Posterior dorsal area* bounded by a ridge descending from the umbones towards the posterior angle. *Sculpture* consisting of irregular fine concentric lines, more

prominent on the posterior dorsal area, and fine rather distant radiate striæ. *Epidermis* thin, polished. *Colour* pinkish-white with variable concentric bands of purple, and distant very unequal radial rays of white, sometimes inconspicuous. *Interior* reddish-purple, whitish on the margins and hinge, smooth, shining. *Margins* smooth. *Hinge* narrow, right valve with 2 bifid cardinals; left valve with 1 bifid and a rudimentary anterior cardinal. *Ligament* short, external, much raised. *Adductor-scars* subequal, very superficial. *Pallial sinus* long and broad, coalescent below with the pallial line, narrowly rounded in front.

Length, 54 mm.; height, 28 mm.; diameter, 11 mm.

Type in the British Museum.

Hab.—North and South Islands, and Chatham Islands; in sand and mud in the laminarian and coralline zone.

Fossil.—Miocene and Pliocene.

Subgen. 2. Gobræus, Leach, 1852.

Gobræus, Leach, Moll. Gt. Brit., 1852, 265. Type: *G. variabilis*, Leach = *Solen vespertinus*, Gmelin.

Shell inflated, more or less truncate behind; concentrically striate or nearly smooth, often with fine radial striæ, especially evident on the posterior dorsal region; teeth variable, not more than 3 in the right and 2 in the left valve; sinus rounded in front, rarely shorter than the vertical of the beaks, and often more or less detached from the pallial line.

This group has no circumscription of the dorsal areas, and differs from *Psammobia* most obviously in its blunt and inflated form, with a distinct posterior gape. (Dall.)

Key to Species.

A. Shell moderately large and very solid, with fine concentric striæ which are not much raised .. .. *Stangeri.*
B. Shell rather small and thin, with sharply raised concentric striæ which are lamellate and wavy on the posterior dorsal end .. *zelandica.*

2. Psammobia Stangeri, Gray, 1843. Plate 61, figs. 9, *a*.

Psammobia Stangeri, Gray, Dieff. N.Z., 253; C.M.M., 65; Conch. Icon., x, 1856, f. 12; Crit. List, 42; M.N.Z.M., 141; Hutton, J. de Conch., xxvi, 46; P.L.S. N.S.W., ix, 519.

Shell moderately large, oblong, solid, rather ventricose, concentrically striated, purplish-white with radial rays of darker. *Beaks* contiguous, but little raised, situate a little in front of the middle, blunt and incurved. *Anterior end* a little shorter, convex, the dorsal margin nearly straight, very slowly descending; *posterior end* obliquely truncated, narrowly rounded below, the dorsal margin straight, horizontal, ventral margin very little convex. The posterior *dorsal area* very faintly marked by a blunt ridge descending from the umbones.

Sculpture consisting of unequal and fine concentric striæ, crossed by minute and dense radial lines. *Epidermis* thick, dark brown, mostly worn off. *Colour* whitish or purplish-white, with numerous unequally distributed radial rays of purple, interrupted by concentric whitish bands. *Interior* purplish-white, the radial rays of purple marked and very distinct at the ventral margins, the part between the scars and the pallial impressions prominently callous, with 2 anterior and 1 posterior radial rays of shell-substance. *Margins* smooth, blunt. *Hinge* with strong nymphs; right valve with 2, sometimes only 1, erect bifid teeth; left valve with 1 bifid cardinal. *Ligament* external, short, and very high. *Adductor-scars* unequal, impressed, the anterior pyriform, the posterior roundish, larger. *Pallial sinus* large and deep, linguiform, the posterior lower part coalescent with the pallial line, extending beyond the vertical of the beaks.

Length, 55 mm.; height, 33 mm.; diameter, 18 mm.

Type in the British Museum.

Hab.—Throughout New Zealand; in sandy and muddy bottom, below low-water mark.

Maori.—Wahawaha (*teste* Hutton).

Fossil.—Miocene and Pliocene.

3. Psammobia zelandica, Deshayes, 1855. Plate 62, fig. 10.

Psammobia zelandica, Desh., P.Z.S., 1854 (1855), 319; Crit. List, 42; Hutton, J. de Conch., xxvi, 47; M.N.Z.M., 142; Bertin, Nouv. Arch. (2), iii, 1880, 119, pl. 5, f. 5. *P. neozelanica*, Desh.: Hutton, P.L.S. N.S.W., ix, 520. *P. zonalis*, Lamarck (?): Hutton, C.M.M., 66; not of Lamarck.

Shell rather small, oblong, thin, subequilateral, slightly ventricose, sharply concentrically striated, whitish with radial rays of red. *Beaks* not prominent, small, pointed, incurved. *Anterior end* sometimes very little shorter, narrowly rounded above, the dorsal margin lightly convex and slowly descending; *posterior end* rounded or obliquely truncate, the dorsal margin straight or faintly concave; basal margin broadly rounded. Posterior *dorsal area* marked by a faint ridge descending from the beaks to the lower posterior end. *Sculpture* consisting of fine and sharp concentric striæ, deeper and waved on the posterior dorsal end, and crossed by very fine radial striæ. *Colour* white or light orange with interrupted rays of purplish-red descending from the beaks. *Interior* white or reddish-purple, polished, showing the radial rays distinctly towards the margins. *Margins* smooth. *Hinge* with short, strong nymphs; right valve with 2 diverging grooved cardinals; left valve with 1 vertical bifid cardinal. *Ligament* short, strong. *Adductor-scars* unequal, impressed, the anterior pyriform, the posterior roundish. *Pallial sinus* large, deep and broad, extending a little beyond the middle, broadly rounded in front, and for the greater part coalescing with the pallial line below.

Length, 27 mm. ; height, 16 mm. ; diameter, 8 mm.

Type, which was in the Cuming collection, lost.

Hab.—Cape Maria van Diemen ; near Channel Island, Hauraki Gulf, in 25 fathoms ; Port Pegasus, Stewart Island, in 18 fathoms. (Captain Bollons.)

Genus 2. Soletellina, Blainville, 1824.

Soletellina, Blainv., Dict. Sci. Nat., 1824 ; Manuel de Malac., 1825, 568. Type : *Solen diphos*, Gmelin (= *S. radiata*, Blainv.). *Aulus* (sp.), Oken, 1815. *Hiatula* (sp.), Modeer, 1793. *Solenotellina*, Mörch, 1853.

Shell moderately large, transverse, elongated or oval, equivalve, inequilateral, compressed, gaping at both extremities, with a greenish epidermis ; the anterior end typically shorter, rounded ; beaks not prominent ; hinge with 1 or 2 small cardinal teeth in each valve ; ligament short, very thick, inserted on very strong nymphs ; pallial sinus narrowing to a point in front, below wholly confluent with the pallial line ; pallial impression rude and irregular.

Distribution.—Indian Ocean, Philippines, Australasia.

Fossil.—Tertiary.

Key to Species.

A. Anterior end considerably longer, the posterior end subangulated at the middle ; colour purplish-olive .. .. .. *nitida.*
B. Anterior end but little longer, the posterior end obliquely truncated ; colour yellowish and greenish-brown .. .. .. *siliqua.*

1. Soletellina nitida, Gray, 1843. Plate 62, fig. 11.

Psammobia nitida, Gray, Dieff. N.Z., 253. *Soletellina nitida*, Gray, Conch. Icon., x, 1857, f. 6 ; Crit. List, 41 ; Ereb. & Ter., 5, pl. 2, f. 9 ; Hutton, J. de Conch., xxvi, 47 ; M.N.Z.M., 142. *Hiatula nitida*, Gray, C.M.M., 66 ; Hutton, P.L.S. N.S.W., ix, 520. *Solenotellina nitida*, Gray, Index, 89.

Shell rather small, inequilateral, compressed, oval, oblong, subangulated posteriorly, thin, purplish-olive, almost quite smooth, polished. *Beaks* very small, contiguous, slightly excavated behind. *Anterior side* longer and much broader, convex, the dorsal margin long, straight, or lightly convex, very little descending ; *posterior end* narrow, tapering, subangulated at the middle, the dorsal margin convex and slowly descending ; ventral margin broadly rounded and faintly concave posteriorly. *Sculpture* consisting of concentric growth-lines and very fine microscopic radial striæ. *Epidermis* transparent, yellowish-brown, shining. *Colour* purple at the umbones, yellowish-olive with violet concentric bands outside, with 2 light whitish radial very oblique posterior rays. *Interior* with a white callosity in the umbonal cavity and between the scars, light violet outside it. *Margins* thin and sharp, smooth, the epidermis extending a little beyond. *Hinge* narrow, with fairly strong nymphs, right valve with 2 cardinals, the posterior sometimes very small ; left valve 2 cardinals, the anterior fairly strong, the posterior a thin triangularly raised lamella. *Liga-*

ment short, strong, much raised externally. *Adductor-scars* unequal, the anterior oblong, the posterior irregularly rounded. *Pallial sinus* long, horizontal, coalescent with the pallial line, narrowly rounded in front.

Length, 50 mm.; height, 26 mm. (type). Length, 42 mm.; height, 22 mm.; diameter, 7·5 mm.

Type in the British Museum.

Hab.—Throughout New Zealand, in 2 to 5 fathoms, in sandy bottom. Kermadec Islands (Captain Bollons.)

Fossil.—Miocene and Pliocene.

2. Soletellina siliqua, Reeve, 1857. Plate 62, fig. 12.

Soletellina siliqua, Reeve, Conch. Icon., x, 1857, f. 10; Crit. List, 42; M.N.Z.M., 142. *Solenotellina siliqua*, Reeve, Index, 89. *Hiatula siliquæ*, Hart., C.M.M., 66. *H. siliqua*, Reeve: Hutton, P.L.S. N.S.W., ix, 520. *Solenotellina nitens*, Tryon, Amer. Journ. Conch., v, 1870, 171, pl. 16, f. 9; C.M.M., 66; M.N.Z.M., 143.

Shell oblong, transverse, thin, inequilateral, shining, yellowish-brown, obliquely truncated and subangled behind, with fine growth-lines. *Beaks* small, not raised. *Anterior end* usually slightly longer, rounded, the dorsal margin straight, but slowly descending; *posterior end* obliquely truncated, narrowly rounded or angled towards the ventral margin, dorsal margin convex, rather rapidly descending; ventral margin broadly rounded. *Sculpture* consisting of very fine growth-lines and distant fine radial scratches. *Epidermis* thin, horny, shining. *Colour* yellowish and greenish-brown, with concentric bands of lighter and 2 obscure posterior rays. *Interior* bluish or purplish-white. *Margins* thin, smooth, sharp, the epidermis extending a little beyond them. *Hinge* very narrow, with strong nymphs; right valve with 2 cardinals, sometimes a third rudimentary posterior tooth is present; left valve with 2 diverging cardinals, the anterior triangular, the posterior thin and rather long. *Ligament* strong, short, external, and much raised. *Adductor-scars* unequal, the anterior smaller, elongate, the posterior roundish. *Pallial sinus* large and deep, extending to the anterior third of the length of the valves, descending and angular in front, coalescent below with the pallial line.

Length, 45 mm.; height, 23 mm.; diameter, 10 mm.

Type in the British Museum.

Hab.—New Zealand (Hart, Strange, Dr. T. B. Wilson). Auckland Harbour; Lyttelton Harbour, in 2–4 fathoms; Akaroa Harbour (H. S.); Preservation Inlet.

Remark.—On examining specimens from different localities I found it impossible to separate the several species which were chiefly based on the more rounded or slightly rostrate posterior end. All intermediate forms occur, but the sculpture, the hinge, and the pallial sinus are similar in all forms.

Fam. CORBULIDÆ, Fleming.

Animal with the siphons short, united, naked, and wholly retractile. Dicœcious.

Shell small, subtrigonal, inequivalve, the left valve less convex than the right; pallial line feeble or obsolete; the ligament usually subexternal, separated from the resilium, which is internal, transverse (alivincular), and extending on both sides of the beaks (amphidetic); the chondrophore is received into a socket of the opposite valve, not verged with the valve-margin; hinge with 1 or 2 subumbonal projecting teeth, and rarely obscure traces of laterals; posterior gape inconspicuous.

Trias to Recent.

Genus 1. CORBULA (Bruguière), Lamarck, 1799.

Corbula, Bruguière, Encycl. Méth., 1797, 230; Lamarck, Prodr., 1799, 89. Type: *C. gallica*, Lamarck. *Aloidis*, Muehlfeldt, 1811. *Lentidium*, C. & J., 1832. *Erodona*, Daudin, 1800. *Azara*, d'Orbigny, 1839. *Potamomya*, Sowerby, 1835. *Corbulamya*, Nyst, 1846. *Erodina*, Gray, 1847. *Pachydon*, Gabb, 1868. *Agina*, Gray, 1847. *Anisothyris*, Conrad, 1870. *Anisorhynchus*, Meek, 1872. *Cuneocorbula*, Cossmann, 1886. *Bothrocorbula*, Gabb, 1872. *Bicorbula*, Fischer, 1887. Not *Corbula*, Bolten, 1798.

Shell having the valves unequal, the right usually larger, both more or less rostrate; right valve with a single large tooth below the beak, with a deep resiliary pit behind it, and no lateral laminæ; the left valve without laterals, with a more or less prominent process upon which the resilium and ligament are inserted, in front of a socket into which the cardinal tooth of the right valve fits; the posterior margin of this socket is sometimes elevated like an indistinct tooth; beaks prominent, prosogyrate or erect, the right one usually superior to the left; sculpture variable; often discrepant on the 2 valves, rarely reticulate, and never strongly radial; pallial line with a small sinus, or none; lunule and escutcheon usually absent; ligament chiefly internal.

Distribution.—Europe, United States of America, west Africa, China, Australasia, &c. Chiefly marine.

Fossil.—Secondary and Tertiary.

Vernacular Name.—Basket-shell.

KEY TO SECTIONS.

A. Right valve with a cardinal tooth below the beak.
  a. Without keels on the rostrum .. .. .. CORBULA, s. str.
  b. Rostrum keeled .. .. ALOIDIS.
B. Right valve with a deep pit for the resilium, hinge-plate turned up on each side of the pit, but no distinct cardinal tooth .. .. ERODONA

Sect. 1. CORBULA, s. str.

Type: *C. gallica*, Lamarck. *Bicorbula*, Fischer, 1887.

Shell subtrigonal, ligament internal, globose, valves feebly concentrically sculptured with no rostral keels, sculpture discrepant on the 2 valves.

1. Corbula gibba, Olivi, 1792. Plate 55, fig. 2.

Tellina gibba, Olivi, Zool. Adriat., 1792, 101. *Mya inæquivalvis*, Montagu, Test. Brit., 1803, 38, suppl. pl. 26, f. 7. *Corbula nucleus*, Lamarck, A.s.V. (ed. Desh.), vi, 139: Conch. Icon., ii, pl. 2, f. 10: Forbes and Hanley, Brit. Moll., i, 180, pl. 9, f. 7–12; pl. G, f. 3. *C. striata*, Fleming, Brit. Anim., 425. *C. olympica*, Costa, Test. Sicil., 27. *C. rotundata*, Sowerby, Min. Conch., 572.

Shell more or less triangular, solid, very inequivalve, inequilateral; the right valve ventricose, overlapping the left at the base and projecting beyond it at the umbones, closely grooved; the left valve smaller, less ventricose, with fine concentric striæ and a few fine radiating lines. *Beaks* slightly raised, convex, incurved, the right umbo almost resting on the margin of the left valve. *Anterior end* usually shorter, convex, the dorsal margin straight, sloping; *posterior end* more or less produced and rostrate, narrowly truncated, the dorsal margin slightly concave, very slowly descending; ventral margin more or less arched, more ascending behind. *Area* excavated in front and behind the umbones. *Sculpture*: Right valve with 2 low posterior ridges extending from the umbo to the truncation behind, closely concentrically ribbed, the ribs smooth, rounded, the interstices a little narrower, with a few well-marked periods of rest; left valve almost smooth, with fine concentric lines and distant radiate striæ, an indistinct ridge running from the beak to the lower end of the rostrum. *Epidermis* persistent on the left valve only, rather thick, umber-brown. *Colour* white, brown at the dorsal and ventral margins. *Interior* almost devoid of colour. *Hinge:* Right valve with a strong somewhat recurved tooth. *Pallial line* entire.

Length, 12 mm.; height, 8 mm.; diameter, 7 mm.

Hab.—Chatham Islands.

The species is common in the British seas, coasts of the Continent of Europe, Mediterranean included, ranging in depth from a few to about 70 fathoms.

Remarks.—Professor W. B. Benham kindly lent me the type of Hutton's *C. Haastiana*, and to Mr. Edgar R. Waite I am indebted for the loan of a perfect specimen labelled by the late Captain Hutton, "*C. Haastiana;* locality, Chatham Islands." On comparing the latter specimen with the type I found it to be quite distinct, and, studying the diagnoses of various species of the genus, and looking over the species in my collection, I found the Chatham Island shell to agree in every respect with *C. gibba*, Olivi. This is the only specimen from New Zealand waters I have seen. The peculiarity of

distribution it shares with several other bivalves—viz., *Arca reticulata*, *Lima lima*, *Cardita calyculata*, *Venericardia corbis*, *Thyasira flexuosa*, &c.

Fossil in Great Britain, dating back to the Coralline Crag.

Section 2. Aloidis, Megerle, 1811.

Aloidis, Megerle von Muehlfeldt, Entw., 1811, 67. Type: *Corbula sulcata*, Lamarck.

Like *Corbula*, but with strong concentric sculpture and keeled rostrum.

Key to Species.

A. Valves rather thin, dorsal and posterior margins usually pink colour *macilenta*.
B. Valves very thick and solid, more ventricose, colour yellowish-grey *zelandica*.

2. Corbula macilenta, Hutton, 1873. Plate 55, figs. 3, *a*.

Corbula macilenta, Hutton, C. Tert. M., 18; Suter, T.N.Z.I., xxxviii, 319. *C. erythrodon*, Lamarck: Hutton, J. de Conch., xxvi, 44; M.N.Z.M., 135; P.L.S. N.S.W., ix, 513; Index, 88; not of Lamarck. *C. pura*, Webster, T.N.Z.I., xxxvii, 1904 (1905), 279, pl. 10, f. 12.

Shell small, oblong, subtrigonal, inequivalve and inequilateral, rather thin, sharply angled behind, concentrically striated, white with pink on the dorsal and posterior margins. *Beaks* somewhat raised, that of the right valve a little higher, approximate, directed forwards, with a distinct anterior and posterior keel. *Anterior end* shorter, narrowly convex, the dorsal margin a little excavated in front of the umbones, descending; *posterior end* obliquely truncated, sharply angled below, the dorsal margin straight, oblique; basal margin broadly convex. *Lunule* not distinctly defined. *Escutcheon* long and rather broad, elliptical, limited by keels descending from the beaks towards the posterior angle, with a median ridge on the right valve. *Sculpture* consisting of somewhat distant sharp concentric ribs, the interstices with microscopic concentric and radial fine lines; the sculpture is usually more pronounced on the left valve. *Colour* dirty-white, the dorsal and posterior margins usually pinkish. *Interior* white above and behind pink. *Margins* smooth, thin, and sharp, that of the right valve advancing a little over the left. *Hinge*: Right valve with a small subumbonal tooth, slightly turned upward; left valve with a horizontal process and a small posterior tubercle, a deep socket in front. *Ligament* small, internal. *Adductor-scars* large, subequal. *Pallial line* distinct, entire.

Length, 13 mm.; height, 7·5 mm.; diameter, 5 mm. (type).

Type, from the Pliocene, in the Dominion Museum, Wellington.

Hab.—North Island: Auckland Harbour; near Channel Island, Hauraki Gulf, in 25 fathoms; near Cuvier Island, in 38 fathoms (Captain Bollons); Titahi Bay, Cook Strait (Miss Mestayer).

Fossil in the Pliocene.

3. Corbula zelandica, Quoy and Gaimard, 1835. Plate 55, fig. 4.

Corbula zelandica, Q. & G., Voy. Astrol., iii, 1835, 511, pl. 85, f. 12–14; Dieff. N.Z., 256; C.M.M, 61; Crit. List, 41; J. de Conch., xxvi, 44; M.N.Z.M., 135; P.L.S. N.S.W., ix, 513; Index, 88; Hedley, T.N.Z.I., xxxviii, 75. *C. Catlowæ*, Reeve, P.Z.S., 1844; Conch. Icon., ii, 1844, f. 21; C.M.M., 61; Crit. List, 41.

Shell small, oval, subtrigonal, subequivalve, inequilateral, ventricose, thick and solid, the right valve embracing the left, both valves about equally convex, strongly concentrically striated. *Beaks* approximate, not much raised, tumid, turned forward, with a posterior keel. *Anterior end* narrowly convex, a little shorter than the posterior, dorsal margin oblique; *posterior end* sharply angled below, slightly flaxuous, the right valve a little longer; basal margin broadly rounded. *Lunule* not defined. *Escutcheon* limited by a keel on each side descending from the beak toward the posterior angle, a median ridge on the right valve. *Sculpture* consisting of numerous fine concentric striæ with a number of periods of rest, marked by deep grooves, much more prominent on the left valve; fine radial striæ are usually present. *Colour* yellowish-grey. *Interior* reddish or purplish-brown, darker at the margins. *Margins* smooth, usually much thickened, sharp. *Hinge:* Right valve with an elevated, upturned tooth, and a deep resilifer behind it; left valve with an erect process behind the socket and a posterior tubercle. *Ligament* internal. *Adductor-scars* unequal, the anterior pyriform, the posterior roundish. *Pallial line* entire.

Length, 13·5 mm.; height, 9 mm.; diameter, 6·7 mm. (type).

Type in the Mus. Hist. Nat., Paris.

Hab.—Throughout New Zealand, but more common in the north. The type is from Hauraki Gulf. Off Great Barrier Island, in 110 fathoms; near Cuvier Island, in 38 fathoms; near Little Barrier Island, in 20 fathoms; near Channel Island, Hauraki Gulf, in 25 fathoms; off Wanganui, in 10–30 fathoms; Wellington Harbour; Wet Jacket Arm, Dusky Sound, in 12 fathoms. Also Australia.

Fossil in the Pliocene.

Sect. 3. Erodona, Daudin, 1800.

Erodona, Daudin, Mem. Moll., Vers., &c., ? 1800; Dall, Trans. Wagn. Free Inst., iii, pt. 4, 839. Type: *Mya labiata*, Maton. *Potamomya*, Sowerby, 1835. *Azara*, d'Orbigny, 1839.

Shell elongate-triangular, feebly concentrically sculptured, with a conspicuous epidermis, the left umbo superior, though the left valve is not the larger; hinge of a strong, nearly vertical process supporting the resilium, with a small socket on each side in the left valve; in the right valve a deep central pit for the resilium, the edges of the hinge-plate bordering it turned up on each side as a narrow projection fitting into the sockets opposite, but no well-defined cardinal tooth or laterals; the ligament is obsolete. (Dall.)

4. Corbula Haastiana, Hutton, 1878. Plate 55, fig. 5.

Corbula Haastiana, Hutton, J. de Conch., xxvi, 44; M.N.Z.M., 135; P.L.S. N.S.W., ix, 514; Index, 88.

Of the unique type specimen the left valve is lost, and in his diagnosis the late Captain Hutton undoubtedly took the right valve for the left.

Shell subtrigonal, very inequivalve, covered with a brown epidermis; rounded anteriorly, absolutely keeled posteriorly; left valve very finely striated, the right deeply grooved; ventral margin sinuated posteriorly; yellowish-white. (Hutton, emended.)

Right valve concentrically closely ribbed, the interstices linear. *Hinge* with a very deep pit below the beak, with a short lamellar elevation anteriorly, and 2 lamellæ close together at the hind end, followed by a blunt, tooth-like projection on the hinge-plate.

Length, 10 mm.; height, 10 mm.; diameter of right valve, 6 mm.

Hab.—Lyttelton (Dr. von Haast).

Remark.—The right valve seems to agree with the characters mentioned for the section.

Fam. SAXICAVIDÆ, Gray.

Glycymeridæ, Fischer.

Animal with the mantle extensively closed, with a small pedal orifice; siphons elongate, covered by a chitinous sheath, and wholly or largely united; gills prolonged into the branchial siphon; foot small.

Shell-substance cellulo-crystalline, earthy, with a conspicuous epidermis; valves equal, free, rude, and often irregular, more or less gaping and elongated, not fully covering the animal; adductor-scars often irregular, the pallial line discontinuous or irregular, the sinus distinct; shell-margins smooth; area obsolete; ligament and resilium external, parivincular, seated on strong nymphs, sometimes widely extended; hinge without laterals, with few feeble or obsolete subumbonal cardinals.

Cretaceous to Recent.

KEY TO GENERA.

A. Shell small, irregular in form, not very widely gaping; pallial sinus shallow .. .. SAXICAVA.
B. Shell large, elongately oblong, very widely gaping behind; pallial sinus large, broadly triangular .. .. PANOPEA.

Genus 1. SAXICAVA, F. de Bellevue, 1802.

Saxicava, F. de Bellevue, Bull. Soc. Philom., No. 62, 1802, 5, 10. Type: *Mya arctica*, L. *Hiatella*, Daudin, 1802, &c.

Animal perforating or free, attached by its byssus; mantle-lobes united and thickened in front; palpi small, free; siphons large, united nearly to their ends, orifices fringed.

Shell small, irregular, very inequilateral, the young with a single cardinal tooth under the beak in each valve, the adult with the teeth obsolete; ligament external, more or less prominent. Muscular impressions strong, wide apart; pallial line interrupted, sinuated posteriorly.

Distribution.—Universal in the temperate and colder seas.

Fossil in the Tertiary.

Vernacular Name.—Rock-borer.

1. Saxicava arctica, Linné, 1767. Plate 55, figs. 6, *a*.

Mya arctica, L., Syst. Nat., ed. 12, 1767, 1113. *Saxicava arctica*, L., C.M.M., 60; Crit. List, 41; Chall. Rep., xiii, 78; Index, 88. *Solen minutus*, L., *op. cit.*, 1115. *Saxicava rugosa*, Lamarck, A.s.V., v, 1818, 501. *Corbula australis*, Lamarck, *op. cit.*, 495. *Saxicava australis*, Lam., M.N.Z.M., 134; Hutton, P.L.S. N.S.W., ix, 513. *S. spinifera*, Sowerby, Conch. Icon., xx, f. 12. There are many more synonyms.

Shell small, polymorphous, inequilateral, usually oblong, very rugose, thin, sometimes fragile, young specimens very often with posterior spinous ridges, white or light brown. *Beaks* approximate, slightly raised, tumid, tricarinate, 1 anterior and 2 posterior, incurved and acute. *Anterior end* much shorter, usually truncated or convex and very rapidly descending; *posterior end* frequently very long, truncated or convex; the basal margin broadly convex or more or less deeply sinuated. *Epidermis* thin, dull, brown. *Sculpture* consisting of very irregular, concentric, sharply raised, often anastomosing riblets, crowded in front, distant and rather lamellar posteriorly; 2 sharp ridges are descending on each valve from the umbones towards the posterior end, and in young specimens are usually ornamented with small tubular spines. *Colour* light brown or nearly white. *Interior* white, slightly shining, smooth. *Hinge* very narrow; right valve with an oblique small tooth below and just in front of the umbo, and a socket behind it; left valve with a small, conical, upturned tooth a little behind the beak. *Ligament* external, short, rather prominent. *Adductor-scars* unequal, the posterior larger. *Pallial sinus* shallow.

Dimensions extremely variable, the greatest length of shells I have seen being 17 mm.

Hab.—Throughout New Zealand, Chatham, Auckland, and Kermadec Islands.

The species is apparently distributed all over the globe, and is found from low-water mark to about 500 fathoms.

Fossil in the Pliocene.

Genus 2. Panopea, Ménard, 1807.

Panopea, Ménard, Annales du Mus., Paris, ix, 1807, 135. Type: *Mya glycymeris*, Born. *Glycimeris*, Lamarck, 1799. *Panopia*, Swainson, 1840.

Animal with long siphons, united as far as their extremities, and invested with a thick, wrinkled epidermis; pedal orifice small; foot

thick and short, grooved. (For notes on the anatomy, see S. P. Woodward, A.M.N.H. (2), xv, 1855, 99—*P. siliqua.*)

Shell equivalve, transversely oblong, solid, gaping at both ends, surface nearly smooth or concentrically striated, inequilateral; hinge formed of a single conical tooth in each valve, lodged in a socket of the opposite valve; ligament external, short and prominent, attached to strong nymphs; pallial line with a deep posterior sinus.

Distribution.—Mediterranean, Atlantic, Cape of Good Hope, Patagonia, Australasia.

Fossil in the Tertiary.

1. **Panopea zelandica,** Quoy and Gaimard, 1835. Plate 61, figs. 10, *a*.

Panopæa zelandica, Q. & G., Voy. Astrol., iii, 1835, 547, pl. 83, f. 7–9; Valenciennes, Arch. Mus. Hist. Nat., Paris, i, pl. 3, f. 2; Conch. Icon., ii, f. 9; Dieff. N.Z., 255; C.M.M., 60; Crit. List, 41; M.N.Z.M., 134; Hutton, P.L.S. N.S.W., ix, 513; Index, 88. *Panopea Solandri*, Gray, Dieff. N.Z., 255; Conch. Icon., f. 6; C.M.M., 60; Crit. List, 41; M.N.Z.M., 134.

Shell large, elongately oval, inequilateral, gaping at both ends, but much more posteriorly, irregularly concentrically ribbed, inflated, but compressed ventrally, rather thin and fragile, white. *Beaks* anterior, flatly raised, incurved, a little excavated in front, approximate. *Anterior end* shorter, regularly convex, gaping, the dorsal margin lightly convex and very little descending; *posterior end* broadly rounded or truncated, the valves slightly expanded, dorsal margin straight or lightly concave, horizontal; basal margin straight, rounded at both ends. *Sculpture* consisting of broad, irregular, angularly raised concentric ribs, the interstices with fine growth-lines; at the posterior end the ribs are broad and flat. *Colour* cream-white. *Interior* white, lightly concentrically grooved. *Margins* smooth, sharp. *Hinge* narrow and short, with strong, short nymphs, and a long, conical, erect tooth in each valve. *Ligament* external, short, very prominent. *Adductor-scars* unequal, not much impressed, the anterior narrow, elongated, the posterior oval or roundish. *Pallial line* somewhat irregular, the pallial sinus moderately deep, broadly triangular.

Length, 73 mm.; height, 52 mm.; diameter, 29 mm. (type). Length, 102 mm.; height, 60 mm.; diameter, 37 mm.

Type in the Mus. Hist. Nat., Paris.

Hab.—North and South Islands, and Chatham Islands; from low-water mark to about 5 fathoms, burrowing 12 in. to 18 in. deep in sand.

Remark.—P. Solandri was found at Tauranga by Dieffenbach; it is a more compressed form.

Fossil.—Miocene and Pliocene.

Suborder 7. ADESMACEA.

Eulamellibranchia with very long united siphons and a largely closed mantle. The foot short, truncated, discoid, and without a byssus. The gills prolonged into the branchial siphon. The shell gaping and devoid of a ligament, but with a styloid apophysis in the umbonal cavities.

Fam. **PHOLADIDÆ**, Adams.

Animal with the edges of the mantle closed, except for a pedal aperture; siphons large, elongated, united nearly to their ends; orifices fringed; gills narrow, prolonged into the branchial siphon, attached throughout, closing the branchial chamber; the heart traversed by the rectum; 2 aortæ; foot short and truncated.

Shell cellular-crystalline, with a thin epidermis; valves more or less gaping in front and behind, with inconspicuous beaks and reticulate often spinose sculpture; in the adult supplemented by accessory shelly pieces, always attached to the valves, but not by an exterior shelly tube; the antero-dorsal margins more or less extensively reflected, the postero-ventral approximated; pallial line sinuated; area none; ligament and resilium usually absent, an obsolete remnant of the resilium and chondrophore sometimes present in the left valve.

The animals of this family are living in calcareous rocks, clay, or submerged wood. During growth the enormous foot is chiefly employed in grinding away the sides of the burrow, which is usually vertical and symmetrical. The animals are vividly phosphorescent in the dark.

Jura to Recent.

Key to Genera.

A. Shell with the anterior gape closed in the adult; valves with a median groove extending obliquely from the beaks to the basal margins, and a posterior horny or calcareous cusp (siphonoplax) .. .. Pholadidea.

B. Shell with the anterior gape always open; valves without median groove; no siphonoplax .. .. .. Barnea.

Genus 1. Pholadidea, Goodall, 1819.

Pholadidea, Goodall, in Turton, Conch. Dict., 1819, 147. Type: *P. Loscombiana*, Goodall. *Cadmusia*, Leach, 1852.

Animal with the siphons united to their ends, where they are surrounded by a fringed disc; a simple anal valve; palpi long and narrow; gills very unequal; foot large and truncated in the young, atrophied and rudimentary in the adult.

Shell equivalve, transversely elongated, convex, gaping in front in the young, but closed by a callous plate in the adult; outer face of the valves divided by a groove extending from the umbones to the ventral margins; with a double anterior accessory plate (protoplax), the other plates (mesoplax and metaplax) present or absent; the

valves prolonged behind into leathery and testaceous cups or a tube (siphonoplax).

Distribution.—European seas, west coast of America, New Zealand.

Fossil in the Tertiary.

KEY TO SPECIES.

A. Siphonoplax horny, without inner calcareous plates .. .. *spathulata.*
B. Siphonoplax horny, with an inner tridentate calcareous plate on each side .. .. *tridens.*

1. Pholadidea spathulata, Sowerby, 1850. Plate 61, fig. 14.

Pholas spathulata, Sow., P.Z.S., 1849 (1850), 162; Conch. Icon., xviii, 1872, f. 45. *Pholadidea spathulata*, Sow.: Hutton, J. de Conch., xxvi, 43; M.N.Z.M., 133.

Shell elongated, inflated, very inequilateral, closed in front in the adult, with a horny posterior cup with spathulate sides, anterior upper side decussate, posterior part concentrically ribbed, white, thin and fragile. *Beaks* not visible from the outside, incurved, blunt. *Anterior end* short, globose, angularly rounded in front, the dorsal margin convex, descending; *posterior end* long, acuminate, the shell-margin truncate, dorsal margin straight. The *siphonoplax* brown, horny, compressed, margined behind, about twice as high as its length, open at the end and below. *Protoplax* consisting of 2 equal calcareous laminæ, united in the middle by a membrane, tapering and pointed in front, with a triangular striated posterior lobe. *Metaplax* consisting of 2 long and narrow, posteriorly sharply pointed calcareous plates, the left broader, united by a thin horny membrane. *Sculpture:* An oblique groove descending obliquely and slightly backwards from the beaks towards the ventral margins divides each valve into an anterior and posterior part, the latter being somewhat longer; the anterior lower callous plates are nearly smooth, with fine concentric and radial lines, the dorsal part is concentrically closely ridged and radially striated at the anterior half, the radial ribs raised and forming sharp triangular teeth; posterior part with somewhat irregular flattish concentric riblets. *Epidermis* thin, horny, light brown, extending beyond the margins of the valves. *Colour* white, the siphonoplax dark brown. *Interior* white, polished, smooth. *Margins* thin and sharp, smooth. *Hinge* enclosing the umbones in a half-circle, rounded, without teeth, but in each umbonal cavity a long, thin, descending apophysis. *Resilium* small, internal, in front of the beaks. Posterior *adductor-scar* dorsal, elongated. *Pallial sinus* broad and deep, broadly rounded in front, extending as far as the oblique groove, which appears as a rib on the inside.

Length, 45 mm.; height, 21 mm.; diameter, 19 mm; length of the siphonoplax, 7 mm.

Type in the British Museum.

Hab.—North and South Islands, as far south as Waikouaiti, Otago; boring in soft rock and clay.

Fossil in the Pliocene.

2. Pholadidea tridens, Gray, 1843. Plate 62, fig. 14.

Talona tridens, Gray, Dieff. N.Z., 254. *Pholas tridens*, Gray, Conch. Icon., xviii, 1872, f. 38; Crit. List, 40. *Pholadidea tridens*, Gray, C.M.M., 59; Ereb. & Ter., 5, pl. 2, f. 8; Hutton, J. de Conch., xxvi, 43; M.N.Z.M., 133; P.L.S. N.S.W., ix, 512; Index, 88.

Shell always smaller than the last species, pyriform, thin and fragile, very inequilateral, closed in front in the adult, with a prominent siphonoplax, which has a marginal rounded rib on the side of the valves, and a median groove on each side. *Beaks* not raised, not visible on the outside, incurved, acute, directed forwards. *Anterior end* closed in the adult, globose, dorsal margin convex; *posterior end* much longer, acuminate, the shell truncated, dorsal margin straight, slowly descending; ventral margin straight or slightly concave. The *siphonoplax* horny or partly calcareous, about as high as long, with a broad, rounded rib on the anterior side, and a deep groove on the middle of the right and left side, inside with a small tridentate shelly piece on each side. *Protoplax* consisting of 2 narrow plates, each with a small posterior lobe; the plates are united by a thin horny membrane, and united with the valves for the whole length. The *metaplax* also forms part of the valves; the lamellæ are long, tapering to a sharp point in front, the right lamella slightly broader. *Sculpture:* The diagonal groove meets the margins at the middle of their length; most of the anterior part is occupied by the convex callous plates, which are finely concentrically striated, the upper triangular part is transformed into a rasp by concentric and radial riblets; posterior part with broad, flat, concentric ribs. *Epidermis* thin, horny, extending beyond the margins of the valves. *Colour* light brown or dirty-white. *Interior* white, polished, the outer diagonal groove producing a prominent rib. *Margins* smooth and sharp. *Hinge* with the umbones in an oval pit; each valve with a small, thin, obliquely descending apophysis in the umbonal cavity. *Resilium* in the cavity of the protoplax in front of the beaks. Posterior *adductor-scar* dorsal, impressed, elongately oval. *Pallial sinus* broad, rounded in front, extending to the median rib.

Length, 20 mm.; height, 11 mm.; diameter, 10 mm.

Type in the British Museum.

Hab.—Northern parts of the North Island, together with the foregoing species, but not so common. Also Ecuador coast.

Genus 2. Barnea, Risso, 1826.

Barnea, Risso, Hist. Eur. Mér., iv, 1826, 376. Type: *B. spinosa*, Risso (= *P. candida*, L.). *Pholas*, Lamarck, 1801; not of 1799. *Cyrtopleura*, Tryon, 1862. *Holopholas*, Fischer, 1887.

Animal with the siphons naked at the base, the orifices cirrated. Shell oblong-ovate, valves with the anterior gape always open; accessory plates not exceeding 2 in number, protoplax and mesoplax; space below the umbonal reflection not divided into cellular cavities

by supporting radial septa ; hinge-plate reflexed over the beaks, closely applied.

Distribution.—Similar to that of *Pholadidea ;* also Australia.

Fossil in the Tertiary.

1. Barnea similis, Gray, 1835. Plate 61, figs. 11, *a*.

Pholas similis, Gray, Yate N.Z., 309 ; Conch. Icon., xviii, 1872, f. 10 ; Crit. List, 40. *B. similis*, Gray, Dieff. N.Z., 254 ; C.M.M., 59 ; Hutton, J. de Conch., xxvi, 43 ; M.N.Z.M., 132 ; P.L.S. N.S.W., ix, 512 ; Index, 88. *Pholas antipodum*, Philippi, Zeitschr. f. Malak., iv, 1847, 71.

Shell fairly large, elongate, acute in front, tapering behind, fairly solid but fragile, very inequilateral, light brown, with concentric laminæ and anterior ribs and spines. *Beaks* hidden, a little behind the anterior fourth of the length. *Anterior end* with a very wide oblique gape, which is not closed in the adult, sharply angled, the dorsal margin lightly convex, descending, concave and very oblique towards the basal margin, which is straight ; *posterior end* laterally compressed, lightly gaping, narrowly rounded. *Protoplax* large, lanceolate, with a median groove and divaricating striæ. *Mesoplax* wanting. *Sculpture* consisting of somewhat irregularly spaced, sharply raised lamellæ, more distant towards the lower and posterior parts of the valves, crossed at the anterior third with sharp radial riblets, widest apart mesially, raised to sharply rounded trigonal spines. *Epidermis* thin, yellowish-brown, extending beyond the margins of the valves. *Colour* light brown, white where the epidermis is lost. *Interior* white, with concentric ribs posteriorly, and radial grooves on the anterior part. *Margins* smooth, the anterior parts with spines on the outside. *Hinge-plate* reflected as a white callus over the umbones and spread as far as the protoplax reaches, the reflexion free anteriorly ; left valve with a tooth-like projection, a little excavated in front, which serves as resilifer for the small resilium ; right valve with the resilifer forming a stout, short projection, narrowly hollowed behind ; a long slender apophysis descending from the umbonal cavity. *Ligament* represented by transverse muscles extending from one valve to the other underneath the protoplax. *Adductor-scars* very unequal ; the anterior at the angle of the valves, small ; the posterior dorsal, a little behind the middle, elongated, and fairly large. *Pallial sinus* deep and broad, extending to the radial grooves, broadly convex in front.

Length, 68 mm. ; height, 22 mm. ; diameter, 22 mm.

Type in the British Museum.

Hab.—Common in the North Island, rarer in the South ; burrowing in soft rock, clay, peat, &c., between tide-marks.

Maori.—Patiotio (*teste* Captain Bollons).

Fossil in the Pliocene.

Fam. **TEREDINIDÆ**, Fleming.

Animal vermiform, very long, a small part only (the viscera) protected by the shell; siphons very long, united to a large extent, and furnished with 2 posterior calcareous pallets, simple or articulated; heart on the ventral side of the rectum; a single aorta.

Shell much reduced, equivalve, auriculate, widely gaping, the valves apposited ventrally only, on the surface of a parietal tubercle; adductor-scars unequal, the anterior marginal, very small; pallial line coincident with the valve-margins; a styloid myophore projecting from the cavity of the beaks; mantle secreting a calcareous lining to the burrow; pallets variable in form, the valves without attached accessory plates; area none; hinge-margin reflected, edentulous; ligament absent or obsolete; anterior adductor degenerate, attached on the anterior edges of the valves, and covered only by the mantle.

Animal boring chiefly in wood.

Jura to Recent.

Genus 1. TEREDO, Linné, 1758.

Teredo, Linné, Syst. Nat., ed. 10, 1758, 651. Type: *T. navalis*, L. *Xylophagus*, Meuschen, 1781.

Animal with very narrow palpi; gills narrow, elongated, extending into the branchial siphon; siphons very long, united, but separated distally, unequal, the orifices fringed; mantle thick, open in front for the small convex foot; the dorsal expansion of the mantle covers the apical and dorsal part of the shell. Pallets simple or articulated.

Anatomy: P. M. Keer, Bijdrage tot de Kennis v. d. Paalworm; Leiden, 1903.

Shell more or less globose, gaping anteriorly and behind; valves trilobate, concentrically striated, divided by a single transverse groove; hinge-margins inflexed anteriorly; interior with a long, curved process, the styloid apophysis.

Distributed in all seas.

Fossil in the Secondary and Tertiary.

Vernacular Name.—Shipworm.

Remarks.—The Teredines are living in wood, which they perforate tortuously, but generally in the direction of the grain; the perforations are lined by calcareous matter, and the individuals carefully avoid the burrows of their neighbours. They do incalculable mischief to dikes, submerged piles, and the timber of ships.

The larvæ swim freely about, and are even able to float at the surface of the water. The embryology of *Teredo* has been studied by B. Hatschek ("Ueber Entwicklungsgeschichte von Teredo"; Wien, 1880).

Boring of the Teredo.—Mr. Charles Hedley has been discussing the boring of the shipworms at some length (Proc. Austral Assoc. Adv. Sci., 1901, 244), and arrived at the conclusion, based chiefly on the ingenious explanation of Dr. W. H. Dall (Trans. Wagn. Free Inst., iii,

pt. 3, 498), that the work of boring is done with the foot. Dr. Dall, however, does not mention *Teredo*, and he also does not include that genus when he explains the boring of the *Pholads*, on page 496.

I am unable to share Mr. Hedley's opinion, for the following reasons: (1) The foot of the shipworms is quite rudimentary, and not of an enormous size as in the Pholads; (2) I am fully convinced that it is next to impossible to bore successfully in fibrous timber with the soft foot alone, but it is easily understood to be practicable in the softer kinds of rocks; (3) if the boring were done with the soft foot there would be no noise—one could not hear the shipworms "grinding," as quoted by Hedley. No doubt the best explanation is given by Brehm in "Illustristes Tierleben" (Volksausgabe, iii, 842): According to *direct* observations the *Teredo*, when boring, uses the two valves like two jaws or the two edges of pincers, but with the difference that their movements are successive and in planes at right angles to one another. The valves possess (in most of the species) at the anterior margins numerous minute teeth arranged in such a way that the wood is cut up into minute square pieces at each stroke of the valve. The teeth, it is said, are very little worn off, because they do not scrape, but cut, and because during growth of the valves by additional fresh shelly layers they are surpassed by fresh teeth.

In the Eocene and Miocene periods New Zealand had a species of Teredo (*T. Heaphyi*, Zittel), which seems to have died out, since it has not been found in the Pliocene. Unfortunately, two introduced species have taken up its place in more recent times.

Subgen. 1. TEREDO, s. str.

Mantle at the base of siphons, and pallets without a cup-shaped fold; siphons separated near the posterior end. Type: *T. navalis*, L.

1. **Teredo Bruguieri,** Delle Chiaje, 1828. Plate 55, figs. 7, *a–d*.

Teredo Brugieri, Delle Chiaje, Memorie, iv. 1828, 28, 32, pl. 54, f. 9–12.
T. norvegica, Spengler, Skr. nat. Selsk., ii, 1792, 102, pl. 2, f. 4–6, B, not binomial; Forbes and Hanley, Brit. Moll., i, 1853, 66, pl. i, f. 1–5.
T. antarctica, Hutton, C.M.M., 59; M.N.Z.M., 133; Hedley, P.L.S. N.S.W., 1894, 503, pl. 32, f. 6, 7; *op. cit.*, 1898, 95; Proc. Austral. Assoc. Adv. Sci., 1901, 248; Index, 88.

Shell globose, valves trilobate, with a rather large anterior area, the body of moderate size, not slender and produced, and the auricle seated on the posterior shoulder, not dilated; a dark-brown band on the posterior part of the body. *Beaks* not prominent, convex, strongly incurved, situate in front of the middle. *Anterior end* produced, sharply angled in front, the dorsal margin excavated, the basal margin not very oblique, nearly rectilinear, and forming a right or somewhat larger angle with the anterior margin of the *body*, which is elongate-triangular, moderately broad, its anterior margin is straight, the posterior very lightly convex, and both of about the same length;

the *posterior auricle* is not very large, about the size of the front triangle or smaller, convex, dorsally somewhat excavated. *Front dorsal area* on each valve semicircular, limited by a sharp carina, excavated, but with a central elevation which is rugosely concentrically grooved. *Posterior dorsal area* long, narrow, excavated and inclined, bounded by a sharp ridge. *Sculpture:* The front triangular area is concentrically traversed by elevated close-set striæ, which diverge from the anterior dorsal edge; to these succeed another series of much finer and denser lines, crossed by microscopic fine transverse striæ, producing a subgranular decussation; these striæ, uninterrupted by either linear callosity or impressed striæ, unite almost at right angles with the striæ of the anterior area, and occupy a more or less narrow triangular strip of surface, extending from the beaks to the ventral tubercle; posteriorly they are limited by a linear groove, beyond which more distant concentric lines are visible, which very quickly become obsolete, leaving the hinder side almost smooth; the auricle has fine confluent verrucose granules. *Epidermis* thin, olivaceous. *Colour* olivaceous to very light brown; chestnut behind the line descending from the beaks to the anterior part of the base; white underneath the epidermis. *Internally* there is a kind of prolongation of the beaks, in the shape of a protuberant callosity, which leans towards the interior, and does not project above the dorsal line; this is terminated in the right valve by a narrow shelf-like rim, and in the left by a projecting and recurved tubercular lamina, which juts out rather obliquely. The *apophysis* is moderately oblique, and presents its broader side to the inner disc; it is very thin, and rather wide, swelling out a little at its anterior edge. The *tubercle* which terminates the ventral edge is very solid and not broad, prolonged upwards into a short sharp ridge, continuous with a faint sulcus corresponding with the line on the surface of the body limiting the finely striated anterior area; this part of the shell has a much thicker callosity than the anterior part. *Margins:* The anterior margins are smooth and sharp, the lower one microscopically sharply denticulate; posterior margins smooth, blunt. *Pallets* penniform, somewhat spoon-shaped, convex on one side and concave on the other; a rib-like elevation running down the centre of the latter projects beyond it, and forms a slender, cylindrical, and sometimes flexuous handle. Testaceous *tube* with thin walls, semiconcamerated at its narrower end; the central opening left is oval, but the tube is circular in cross-section.

Measurement of valves from Auckland Harbour: Diameter—Ant.-post., 10 mm.; dorso-ventral, 10 mm.: transverse diameter of one valve, 4 mm.

Type of *T. antarctica* in the Dominion Museum, Wellington.

Hab.—Auckland to Dunedin (Hutton).

Remarks.—I have been able to collect a number of valves, pallets, and tubes of this species from an old wharf-pile, Auckland Harbour,

and the valves agree with the type specimens of *T. antarctica* in the Dominion Museum. No live examples have been obtained, but I hope to get some in the near future. On comparing my specimens with the figures and diagnosis of *T. Bruguieri*, Chiaje, commonly known as *T. norvegica*, Spengler, I found that *T. antarctica*, Hutt., cannot be separated from that European species. Mr. Hedley figured the pallet of *T. antarctica*, after Clessin, Proc. Aust. Assoc. Adv. Sci., 1901, pl. 10, f. 8 (erroneously named *T. Manni*, as Mr. Hedley informed me), which, however, is certainly the bipinnate pallet of *T. navalis*, but not of *T. antarctica*. Hutton describes the pallet as penniform, and all the specimens I found agree with the figures and description given for *T. Bruguieri*.

This mollusc was no doubt, unfortunately, brought to our waters by ships from Europe in the early days. A later importation is *T. Saulii*, which most likely hails from Australia. This latter species seems to displace the older form, for in a stringer of totara timber which had been fixed to the Auckland Wharf during not more than fifteen months I found nothing but living specimens of *T. Saulii*.

Subgen. 2. Xylotrya (Leach), Gray, 1847.

Xylotrya (Leach MS.), Gray, P.Z.S., 1847, 188. Type: *Teredo bipalmulata*, Lamarck, 1801. *Bankia*, Gray, Syn. Brit. Mus. 1840; nude name?

Siphonal pallets elongate, penniform, articulate.

2. Teredo Saulii, Wright, 1865. Plate 55, figs. 8, *a*, *b*.

Nausitora Saulii, Wright, Trans. Linn. Soc., xxv, 1865, 567, pl. 65, f. 9–15. *Calobates Saulii*, Wright: Hedley, P.L.S. N.S.W., 1898, 94, f. 7–9. *Nausitora Saulii*, Wright: Hedley, Proc. Austral. Assoc. Adv. Sci., 1901, 248, pl. 10, f. 5 (pallet). *Teredo fragilis*, Tate, P.R.S. S.Aust., xii, 1889, 60, pl. 11, f. 13.

Shell globose, with broad and deep auricles, extending to within a short distance from the ventral margin. *Beaks* near the anterior end, not raised, convex and incurved. *Anterior end* short, produced, sharply angled in front, the dorsal margin descending, lightly concave, the lower end faintly convex and oblique, forming an angle of about 100° with the long, lightly convex, and subvertical anterior margin of the *body*, which is triangular, its posterior end much shorter, oblique, and somewhat convex; the *posterior auricle* is high and rather broad, the dorsal margin sloping and excavated, the posterior margin straight and curved toward the posterior edge of the body. *Front dorsal area* on each valve elongate-triangular, excavated; *posterior dorsal area* elongated, narrow, bounded by a convex sharp ridge. *Sculpture:* The front triangular area with rather strong and close concentric riblets, the interstices with faint microscopic radiate striæ; the anterior half of the body is very finely radially costate, the riblets much finer than those on the anterior area, and crossed by fine, prominent, microscopic transverse striæ; the posterior half of the body is separated

from the front part by a shallow groove, it is ornamented with distant wavy growth-lines, crossed posteriorly by fine radiate striæ; auricle with faint growth-lines only. *Epidermis* thin, horny. *Colour* yellowish-white with a narrow light-brown streak descending from the beaks to the ventral point. *Interior:* Below each of the rounded beaks there is a very narrow horizontal lamella; the posterior part is strongly callous, a prominent ridge indicating the anterior limit of the auricle. *Apophysis* long and slender, the edges somewhat irregular, presenting its broader side to the inner disc, the lower end not swollen. *Tubercle* at the lower edge stout, with 2 sharp ridges, one extending a short way up the anterior end of the body, the other up the middle of it. *Margins:* Both anterior margins are thin and sharp, smooth, the lower edge not microscopically denticulate; posterior margins smooth, rather blunt. *Pallets* long and narrow, tapering slowly towards the apex, flat on the inner side, rounded on the outer, apparently composed of imbricating and pectinate joints, and with a moderately long cylindrical handle. When disarticulated the pallet is seen to be composed of a central stalk to which are strung laterally compressed little funnel-shaped cups, flat on one side, the largest cups at the bottom; their number varies from 25 to 30, and the length of the pallet is about 20 mm.

Measurement of a shell from Auckland Harbour: Diameter—Ant.-post., 9 mm.; dorso-ventral, 11 mm.: transverse diameter of one valve, 5·5 mm.

Hab.—Auckland Harbour (H. S.); Palliser Bay, in a small piece of timber dredged in 20 fathoms (E. R. Waite). The type is from Port Phillip, Victoria. It also occurs in Tasmania, and Callao, Peru.

Suborder 8. ANATINACEA.

Hermaphrodite *Eulamellibranchia*, in which the ovaries and testes are distinct and have separate orifices. The foot generally rather small. The mantle frequently presents a fourth orifice. The external gill-plate directed dorsally, and devoid of a reflected lamella. Hinge of shell without teeth.

Fam. THRACIIDÆ, Dall.

Animal: Mantle with a fourth pallial orifice; the pedal orifice elongated; siphons rather long, quite separate, and completely retractile and invertible; monœcious; marine.

Shell earthy and cellulo-crystalline, not nacreous; inequivalve, thin, edentulous, often with a granular surface; ligament and resilium chiefly external, opisthodetic, parivincular, seated on posteriorly directed nymphæ; area absent, beaks usually entire; valves nearly closed, with pallial sinus.

Jura to Recent.

Genus 1. Thracia, Blainville, 1824.

Thracia (Leach MS.), Blainville, Dict. Sci. Nat., xxxii, 1824, 347. *Rupicola*, Fleuriau, 1802; not of Brisson, 1760. *Anatina*, Blainville, 1825; transferred to *Osteodesma*. *Hemicyclonosta*, Blainville, 1827; not of Deshayes, 1835. *Odoncinetus*, O. G. Costa, 1829. *Ixartia*, Leach, 1852. *Corymya*, Agassiz, 1843. *Cyathodonta*, Conrad, 1849. *Rupicilla*, Schaufuss, 1867. *Homœodesma*, Fischer, 1887. *Pelopia*, H. Adams, 1868. Type: *T. corbuloidea*, Blainville.

Shell concentrically striated, with more or less fine superficial granulation and very delicate periostracum; subrostrate, slightly gaping behind; slightly inequivalve, the right valve larger; the beaks in contact and usually perforated by friction on each other, the hinge-plate fissured below them and edentulous; the ligament external, the resilium more or less sunken and with, in most cases, a short transverse lithodesma in front of it, occupying the fissure in the hinge-plate; pallial line with a moderate sinus, margins of the valves entire; the nymphs in the typical forms do not project greatly from the hinge-margin ventrally, and are more or less elongated; the shell is destitute of nacre.

Distribution.—Seas of Europe, east coast of North America, Chinese Sea, Australasia, &c.

Fossil in the Secondary and Tertiary.

Vernacular Name.—Lantern-shell.

Key to Species.

A. Shell equivalve, the anterior end longer .. .. .. *vitrea.*
B. Shell inequivalve, the left valve much flatter than the right; equilateral or subequilateral .. .. *transenna.*

1. Thracia transenna, n. sp. Plate 55, figs. 9, *a*.

Shell transversely elongate, thin and fragile, equilateral, inequivalve, the right valve moderately convex, the left flattish, broadly truncated behind, finely concentrically striated. *Beaks* not much raised, small, acute, incurved. *Anterior end* narrowly convex, the dorsal margin straight, sloping; *posterior end* vertically broadly truncated, the dorsal margin lightly concave, angled at the truncation; basal margin broadly rounded. *Sculpture* consisting of numerous prominent concentric striæ, stronger on the right valve, which has 2 posterior oblique ridges, both broadly rounded, the lower descending from the umbo to the lower end of the truncation, the upper one to the middle of it; the microscopic sculpture consists of very fine dense concentric lines, cut up by somewhat irregular and rather distant radial grooves. *Colour* yellowish-white. *Interior* white, dull, sometimes slightly pearly outside the pallial line. *Margins* smooth. *Hinge* with a small lithodesma. *Adductor-scars* slightly unequal, the anterior more elongated. *Pallial sinus* moderately deep and broad, obliquely truncated, the lower end extending as far as the vertical from the beak.

Length, 18 mm. ; height, 13 mm. ; diameter of right valve 4 mm., of left valve 1·5 mm.

Type in my collection.

Hab.—Port Pegasus, Stewart Island, in 12 fathoms (type) ; near Cuvier Island, in 38 fathoms (Captain Bollons).

Remarks.—This species resembles *T. lincolnensis*, Verco, from South Australia, but the latter is obsoletely concentrically ribbed, the left valve is more convex, and the anterior dorsal margin is not so straight.

2. Thracia vitrea, Hutton, 1873. Plate 62, fig. 15.

Lyonsia vitrea, Hutton, C.M.M., 61 ; J. de Conch., xxvi, 44 ; M.N.Z.M., 136.
Thracia vitrea, Hutt., P.L.S. N.S.W., ix, 514 ; Plioc. M., 75, pl. 9, f. 80 ; Index, 87.

Shell moderately large, inequilateral, equivalve, slightly gaping behind, elongately oblong, thin and fragile, truncated posteriorly, concentrically striated, white. *Beaks* at about the posterior third of length, slightly raised, biangulate posteriorly, acute, directed backwards. *Anterior end* longer, convex, the dorsal margin broadly rounded and slowly descending ; *posterior end* obliquely truncated, with 2 angular ridges descending from the beak to the upper and lower angle of the truncation on each valve, dorsal margin slightly excavated behind the beaks, thence straight and oblique ; basal margin faintly convex, slightly ascending behind. *Sculpture* consisting of fine concentric lines with occasional periods of rest and very fine microscopic radial striæ, producing faint granulation, which is sometimes much more pronounced on the posterior part of the valves. *Epidermis* very thin, horny, mostly rubbed off. *Colour* white. *Interior* white, dull, sometimes faintly concentrically ridged. *Margins* smooth, sharp. *Hinge* without teeth, with spoon-shaped nymphs, which, however, get obsolete in the adult shell ; a flat, oblique lithodesma is present in older shells, grown together with the valves, directed backwards. *Ligament* external, short. *Adductor-scars* unequal, superficial, the anterior scar very small, the posterior somewhat larger, trigonal. *Pallial line* distinct, simple, with a deep and broad posterior sinus, extending nearly to the middle, narrowly convex in front.

Length, 20 mm. ; height, 13 mm. (type). Length, 32 mm. ; height, 22 mm. ; diameter, 13 mm.

Type in the Dominion Museum, Wellington.

Hab.—North Island (Hutton) ; Lyttelton Harbour, in 2–4 fathoms (H. S.) ; Stewart Island, in 15 fathoms (A. Hamilton).

Fossil in the Miocene and Pliocene.

Fam. PERIPLOMIDÆ, Dall.

Animal with the siphons separate, naked, completely retractile, but not invertible ; monœcious ; marine.

Shell subnacreous, conspicuously inequivalve, nearly closed, edentulous ; the resilium internal, between 2 anteriorly or vertically

directed resilifers, often buttressed, the lithodesma rarely wanting; ligament and area absent; beaks fissured; pallial sinus broad and shallow

Tertiary and Recent.

Genus 1. Cochlodesma, Couthouy, 1839.

Cochlodesma, Couthouy, Boston Journ. Nat. Hist., ii, 1839, 170. Type: *Anatina Leana*, Conrad. *Ligula* (sp.), Montagu, 1808; not of Bloch, 1781. *Bontœa*, Brown, 1844. *Bontia*, Gray, 1847. *Galaxura*, Leach, 1852.

Shell inequivalve, the surface not granular, subnacreous inside, slightly gaping behind and in front, somewhat inequilateral; clavicular rib supporting the resilifer obsolescent, and in front of the resilifers there is a cartilaginous mass of dark-brown colour, uniting the valves and occupying the place of the lithodesma, but uncalcified; pallial sinus oblong.

Distribution.—East coast of North America, Australasia.

Fossil in the Tertiary.

1. **Cochlodesma Angasi**, Crosse and Fischer, 1864. Plate 61, figs. 12, *a*.

Periploma Angasi, C. & F., J. de Conch., xii, 1864, 349; *op. cit.*, 1865, 427, pl. 11, f. 1. *Anatina Angasi*, C. & F.: Angas, P.Z.S., 1865, 644; Hutton, P.L.S. N.S.W., ix, 514. *Cochlodesma Angasi*, C. & F.: Suter, T.N.Z.I., xxxiv, 220; Hedley, P.L.S. N.S.W., xxvii, 17; Pritchard and Gatliff, P.R.S. Vic., xvi (n.s.), 105; Index, 87; Hedley, T.N.Z.I., xxxviii, 72. *Anatina tasmanica*, Reeve: Hutton, C.M.M., 61; J. de Conch., xxvi, 44; M.N.Z.M., 136; not of Reeve.

Shell attaining a fairly large size, inequivalve and a little inequilateral, right valve ventricose, left valve but little convex, very thin and fragile, smooth, slightly gaping at both ends, posteriorly truncated. *Beaks* prominent, a little posterior, convex and incurved, fissured, the fissure closed up by brown conchin on the inside. *Anterior side* slightly longer, convex, the dorsal margin horizontal and almost straight, left valve with a very low oblique fold descending from the beak to the anterior ventral margin; *posterior end* subrostrate, obliquely truncate, the dorsal margin a little excavated in front of the beaks, straight, very little descending; basal margin convex, ascending and somewhat sinuated posteriorly. *Sculpture* consisting of irregular growth-lines, more prominent at both ends, with well-marked periods of rest; very faint microscopic radial lines. *Epidermis* thin, light brown, forming a number of rather distant radial riblets on the upper posterior end of the right valve. *Colour* white, dirty-white where the epidermis persists. *Interior* white, lightly nacreous. *Margins* smooth and sharp. *Hinge* edentulous, in each valve a spoon-shaped vertical and strongly buttressed resilifer, the resilium stout, extending to the margin of the valves, and uniting them. *Ligament* wanting. *Adductor-scars* superficial, unequal, the anterior elongated, the posterior trigonal. *Pallial sinus* moderately deep, rather narrow, obtuse in front.

Length, 68 mm. ; height, 46 mm. ; diameter, 25 mm.

Type in the collection Journ. de Conchyliologie ?

Hab.—North and South Islands, in sandy mud in sheltered bays, from low-water mark to about 100 fathoms ; not common. Also Australia and Tasmania.

Fossil in the Pliocene.

Fam. **MYOCHAMIDÆ**, Dall.

Animal with short siphons ; a fourth pallial orifice present ; foot small.

Shell very inequivalve, free or sessile, solid, subnacreous, edentulous, the dorsal margins of one valve overlapping those of the other, which fit into corresponding depressions in the shell-wall ; ligament amphidetic, external or absent ; resilium internal, alivincular ; area amphidetic or obsolete, a false area formed on each side of the beaks by the flattened cardinal margin of the valves ; shell closed ; pallial sinus small.

Tertiary to Recent.

Genus 1. Myodora, Gray, 1840.

Myodora, Gray, A.M.N.H., iv, 1840, 306. Type : *Pandora brevis*, Sowerby.

Shell free, inequivalve, compressed, somewhat flexuous, subequilateral, triangularly ovate, rounded in front, contracted and truncated behind, rather thin, white, nacreous within ; right valve more convex than the left, which is usually flat ; resilium narrow, triangular, median, internal ; furnished with a sickle-shaped ossicle (lithodesma), placed below the resilium. Pallial impression sinuated posteriorly.

Distribution.—From the islands of the China Sea and the Philippines to Australasia.

Fossil in the Tertiary.

Key to Species.

A. Shell transversely elongate.
  a. Shell subequilateral. Posteriorly broadly truncated ; interior with radial sulci .. .. .. *pandoriformis.*
  aa. Shell inequilateral.
    b. Anterior end shorter ; posteriorly broadly truncated ; interior with 1 ray descending to front of pallial sinus .. .. *antipodum.*
    bb. Anterior end longer ; posteriorly narrowly truncated ; interior with 1 ray descending to the upper part of the pallial sinus .. .. *Boltoni.*

B. Shell triangular or subtriangular.
  a. Left valve slightly convex. Shell very solid, small, anterior end a little longer .. .. .. *crassa.*
  aa. Left valve flat or lightly concave.
    b. Shell equilateral ; posteriorly broadly truncated ; interior radially sulcate .. .. .. *brevis.*
    bb. Anterior end a little longer ; posteriorly subtruncated ; interior with 2 radial rays .. .. *novæ-zealandiæ.*

C. Shell trigonally ovate or rounded.
- *a.* Shell equilateral, roundly trigonal; right valve very convex; posterior dorsal margin almost straight .. *rotundata.*
- *aa.* Anterior end shorter, ovate-triangular; posterior dorsal margin slightly concave; interior with 1 radial ray in front of the pallial sinus .. .. .. *striata.*
- *aaa.* Anterior end a little longer; ovate triangular; posterior dorsal margin lightly convex; interior with 1 radial ray at the anterior end of the pallial sinus in right valve, a little distant from it in left valve .. *subrostrata.*

1. **Myodora antipodum**, E. A. Smith, 1880. Plate 55, figs. 10, *a*.

Myodora antipodum, E. A. Smith, P.Z.S., 1880, 585, pl. 53, f. 7; Hutton, P.L.S. N.S.W., ix, 516; Index, 88.

Shell transversely elongate, broadly truncated behind, the hinder dorsal slope longer than the anterior, inequilateral, concentrically ribbed, with a posterior oblique ridge on the right valve. *Beaks* small, not much raised, acute, directed backwards. *Anterior end* slightly shorter, acuminately curved, the dorsal margin lightly convex, oblique; *posterior end* broadly truncated, the dorsal margin feebly incurved and slightly oblique; basal margin regularly arcuate. *Sculpture* of right valve consisting of concentric rather coarse liræ, thickest near the anterior side and more flattened posteriorly, crossed by fine and close microscopic striæ; a slightly raised ridge runs from the umbo to the lower end of the truncation; left valve very slightly concave or flat, with very low and broad concentric riblets, stronger at the anterior end, and fine radial lines. *Epidermis* thin, brown, persistent usually only at the margins. *Colour* white where devoid of epidermis. *Interior* white, pearly, with a single ray, curving from the umbones to the lateral boundary of the pallial sinus. *Margins* smooth, thin. *Hinge* with a small central triangular resilium, and a small lithodesma below it. *Adductor-scars* subequal, roundish. *Pallial sinus* broad, not deep, narrowly convex in front.

Length, 13·3 mm.; height, 9 mm.; diameter, 2 mm. (type).

Type in the British Museum.

Hab.—New Zealand (Colonel Bolton). Off Great Barrier Island, in 110 fathoms; near Cuvier Island, in 37 fathoms; Dusky Sound, in 12 to 30 fathoms (Captain Bollons). North of the Auckland Islands, in 85 fathoms (E. R. Waite).

Fossil in the Pliocene.

2. **Myodora Boltoni**, E. A. Smith, 1880. Plate 55, figs. 11, *a*.

Myodora Boltoni, E. A. Smith, P.Z.S., 1880, 585, pl. 53, f. 9; Hutton, P.L.S. N.S.W., ix, 517; Index, 88.

Shell small, transversely elongated, much narrowed posteriorly, and obliquely truncated, inequilateral, the right valve moderately convex, concentrically striated, thin, white. *Beaks* slightly raised, very acute, directed backward. *Anterior end* a little longer, angularly

rounded, the dorsal margin rectilinear and very slightly oblique; *posterior end* rather narrowly truncated, the dorsal margin a little incurved and a trifle shorter than the other; ventral margin convex. *Sculpture:* The convex right valve with a raised ridge from the umbo to the lower end of the truncated extremity, and with a depression between it and the raised margin, the surface almost smooth, with the exception of the posterior end, which is distinctly sulcated, especially upon the raised ridge and the margin; left valve somewhat concave, finely concentrically striated; both valves with very fine and dense microscopic radial lines. *Epidermis* thin, light brown. *Colour* white where devoid of epidermis. *Interior* white, pearly, with a single impressed ray curving from the umbones to the upper boundary of the pallial sinus. *Margins* smooth, sharp. *Hinge* with a small triangular resilium. *Adductor-scars* subequal. *Pallial sinus* rather deep, extending to the vertical of the beaks, ovate, narrowly rounded in front.

Length, 14·3 mm.; height, 9 mm.; diameter, 3 mm. (type).

Type in the British Museum.

Hab.—New Zealand (Colonel Bolton). Auckland Harbour, between tide-marks; Lyttelton Harbour, in 3 fathoms (H. S.). Chatham Islands.

Fossil in the Pliocene.

3. **Myodora brevis,** Sowerby, 1829. Plate 62, fig. 16.

Pandora brevis, Sowerby, App. Stutchbury's Cat., 3, f. 2. *Anatina brevis*, Stutchbury, Zool. Journ., v, 99, Tab. Sup., 43, f. 1, 2. *Myodora brevis*, Hanley, Cat. Rec. Biv. Shells, 24, 338, 339, pl. 10, f. 13; Conch. Icon., ii, pl. 1, f. 7; Chenu, Man. Conch., ii, 52, f. 217; C.M.M., 62; E. A. Smith, P.Z.S., 1880, 580; Chall. Rep., xiii, 64; Pritchard and Gatliff, P.R.S. Vic., xvi (n.s.), 101; Hedley, Mem. A.M., iv, 311; Index, 88. *M. plana*, Reeve: Hutton, J. de Conch., xxvi, 45; M.N.Z.M., 137, not of Reeve.

Shell attaining a fairly large size, subtriangular, equilateral, very broadly truncated behind, with sharp, rather distant, and wavy concentric lirae, fine granular sculpture, and with 2 radial posterior folds. *Beaks* very prominent, acutely curved. *Anterior end* subangled, the dorsal margin straight and rapidly descending; *posterior end* broadly truncated, the dorsal margin concave, oblique; ventral margin broadly rounded. *Sculpture:* The right moderately convex valve has 2 posterior ridges descending from the umbo to the middle and the lower end of the truncation, concentrically, rather distantly lirate, the lirae more or less undulating, sharp, and generally more prominent on the posterior folds; the somewhat concave left valve similarly sculptured, but the riblets are more feeble; both valves are minutely, very distinctly, granular. *Colour* white or greyish-white. *Interior* white, pearly, with numerous radiate sulci, one deeper than the others descending in front of the pallial sinus. *Margins* smooth. *Hinge* with a small resilium and a falciform lithodesma. *Adductor-scars*

unequal, the anterior elongate, the posterior round. *Pallial sinus* shallow, biangulate, straight in front.

Diameter—Ant.-post., 29 mm.; dorso-ventral, 25 mm. thickness, 7 mm.

Type in the British Museum.

Hab.—New Zealand (Colonel Bolton). Stewart Island, in 14 fathoms (C. Traill). Also Australia and Tasmania.

4. Myodora crassa, Stutchbury, 1835. Plate 55, fig. 12.

Anatina crassa, Stutchbury, Zool. Journ., v, 1835, 100, Tab. Sup., 43, f. 5, 6.
Myodora crassa, Stutchb.: Reeve, P.Z.S., 1844, 92; Conch. Icon., ii, pl. 1, f. 1; Hanley, Cat. Rec. Biv. Shells, 25, 339, pl. 10, f. 6; E. A. Smith, P.Z.S., 1880, 581; Hutton, P.L.S. N.S.W., ix, 516; Chall. Rep. xiii, 65; Index, 88.

Shell small, subtriangular, thick, subequivalve, transversely ribbed, left valve less flat or concave than in most other species of the genus. *Anterior end* slightly longer, convex, the dorsal margin long, lightly convex, very oblique; *posterior end* subtruncated, the high dorsal margin rapidly descending, faintly convex, both valves carinated, with a smooth cordate posterior depression. *Sculpture* consisting of distinct concentric lirae and fairly coarse microscopic radiate striae. *Colour* yellowish-white. *Pallial sinus* not deep.

Diameter—Ant.-post., 13 mm.; dorso-ventral, 10·5 mm.

Type in the British Museum.

Hab.—Stewart Island (C. Traill). Also Australia.

I have not seen this species.

5. Myodora novæ-zealandiæ, E. A. Smith, 1880. Plate 55, figs. 13, *a*.

Myodora novæ-zealandiæ, E. A. Smith, P.Z.S., 1880, 584, pl. 53, f. 5; Index, 88. *M. neozelanica*, Smith: Hutton, P.L.S. N.S.W., ix, 516.

Shell small, subequilaterally triangular, concentrically coarsely ribbed, right valve considerably convex, the left a trifle concave, solid, light brown. *Beaks* conspicuous, acute, slightly curved backward. *Anterior end* slightly longer, obtusely angled, the dorsal margin nearly straight, very oblique; *posterior end* subtruncated, the dorsal slope feebly incurved; basal margin broadly convex, ascending posteriorly. *Sculpture* consisting of rather coarse distant concentric riblets, finer on the left valve; right valve with an indistinct shallow groove posteriorly near the margin, where the concentric lirae suddenly stop, leaving a smooth narrow space between their termination and the edge—*i.e.*, a plain posterior dorsal area; the surface of both valves minutely microscopically granular. *Colour* light brown. *Interior* pearly, marked with 2 subparallel or slightly diverging rays or striae, radiating from the umbo a little beyond the centre of the valves. *Margins* smooth, sharp. *Hinge* with a small central resilium and oval lithodesma. *Adductor-scars* unequal, the anterior scar semicircular, the posterior a little higher up and round. *Pallial sinus* not deep, convex.

Diameter — Ant. - post., 9·3 mm.; dorso - ventral, 8·3 mm.: thickness, 3 mm.

Type in the British Museum.

Hab. — Stewart Island, type (C. Traill); Taiaroa Head, in 45 fathoms (A. Hamilton); Banks Peninsula, in shallow water (Iredale); Cuvier Island, in 38 fathoms (Captain Bollons); off Great Barrier Island, in 110 fathoms.

Fossil in the Pliocene.

6. Myodora pandoriformis, Stutchbury, 1835. Plate 55, figs. 14, *a*.

Anatina pandoriformis, Stutchbury, Zool. Journ., v, 1835, 99, Tab. Sup., 43, f. 3, 4; Hanley, Cat. Rec. Biv. Shells, 25. *Myodora pandoræformis*, Stutchb.: Reeve, P.Z.S., 1844, 93; Conch. Icon., ii. pl. 1, f. 10. *M. pandoriformis*, Stutchb.: Hanley, *op. cit.*, pl. 10, f. 9; E. A. Smith, P.Z.S., 1880, 581; Chall. Rep., xiii, 64; Hutton, P.L.S. N.S.W., ix, 515; Index, 88; Pritchard and Gatliff, P.R.S. Vic., xvi (n.s.), 102. *M. brevis*, Sowerby: H. and A. Adams, G.R.M., iii, pl. 98, f. 2; not of Sowerby.

Shell rather small, transversely elongate, subequilateral, moderately solid, broadly truncated behind, with distant fine concentric liræ, the right valve very convex, the left flat or faintly concave. *Beaks* not much raised, sharply pointed, and directed backward. *Anterior end* narrowly convex, the dorsal margin faintly rounded, slowly descending; *posterior end* vertically broadly truncated, the dorsal margin a little excavated and slowly descending, ventral margin regularly convex. *Sculpture:* Right valve with rather distant, sharp, but not high, concentric riblets, more prominent posteriorly, where a ridge runs down from the umbo to the lower angle of the truncation; left valve with much fainter liræ, the posterior oblique ridge obsolete; both valves are microscopically rather distantly radially striated, and have very close concentric lines, which are interrupted by the radii, and distinctly discontinuous. *Colour* greyish-white. *Interior* pearly, radially distantly sulcate. *Margins* smooth. *Hinge* with a small central resilium and a straight elongate ossicle. *Adductor-scars* unequal, the anterior irregularly roundish, the posterior round. *Pallial sinus* shallow, convex.

Diameter—Ant.-post., 18 mm.; dorso-ventral, 12 mm.: thickness, 5 mm.

Type in the British Museum.

Hab.—Stewart Island (C. Traill); Port Pegasus, Stewart Island, in 18 fathoms (Captain Bollons); Banks Peninsula (Iredale). Also Australia and Tasmania.

7. Myodora rotundata, Sowerby, 1875. Plate 55, fig. 15.

Myodora rotundata, Sowerby, P.Z.S., 1875, 129, pl. 24, f. 8; E. A. Smith, P.Z.S., 1880, 580; Hutton, P.L.S. N.S.W., ix, 515; Index, 88. *M. rotunda*, Sowerby: Hutton, M.N.Z.M., 137 (*lapsus calami*).

Shell roundly subtrigonal, very inequivalve, white, both valves concentrically strongly striated, with 2 slight angles on the posterior

side ; dorsal margin excavated, scarcely incurved ; umbones acute, of a bluish tint ; right valve very ventricose, with 2 ribs from the umbones to the posterior margin ; left valve flat ; trigonal ligamentary pit rather small. (Sowerby.)

Diameter—Ant.-post., 25·4 mm. ; dorso-ventral, 23·2 mm. (type).

Type in the British Museum.

Hab.—New Zealand.

Remarks.—This species differs from *M. striata* in having the convex or deep valve much deeper, the hinder dorsal margin proportionally shorter, less incurved, and more sloping, the ligamental pit much smaller, and the contour of the shell more rounded. (E. A. Smith.)

I have not seen this species.

8. **Myodora striata,** Quoy and Gaimard, 1835. Plate 62, fig. 17.

Pandora striata, Q. & G., Voy. Astrol., iii, 1835, 537, pl. 83, f. 10 ; Jay, Cat. Shells, ed. 3, 120, pl. 6, f. 6, 7 ; Hanley, Cat. Rec. Biv. Shells, 50. *Myadora striata*, Q. & G. ; Reeve, P.Z.S., 1844, 93 ; Conch. Icon., ii, pl. 1, f. 6 ; Dieff. N.Z., 255. *Myodora striata*, Desh. ; Chenu, Man. Conch., ii, 52, f. 215 ; Hanley, *op. cit.*, pl. 12, f. 12 ; C.M.M., 62 ; Crit. List, 41 ; M.N.Z.M., 137 ; E. A. Smith, P.Z.S., 1880, 579 ; Hutton, P.L.S. N.S.W., ix, 514 ; Index, 88. *M. brevis*, Sowerby : Woodward, Fischer, Man. Conch., pl. 23, f. 12 ; not of Sowerby.

Shell rather large, ovate-triangular, inequilateral, solid, white, right valve moderately convex, left valve flat, concentrically striated. *Beaks* conspicuous, acute, directed backward. *Anterior end* slightly shorter, angularly rounded, the dorsal margin a little convex, oblique ; *posterior end* narrowly truncated, the dorsal margin a little excavated and oblique ; ventral margin convex, straightened posteriorly. The posterior *dorsal area* conspicuous, laterally oblique, smooth, the margins sharply angled. *Sculpture* consisting of concentric plait-like striæ, strongly raised over the 2 posterior radial folds of the right valve, much finer on the left valve ; microscopic sculpture consisting of fine radial lines and much closer interrupted concentric lines, giving the surface a minutely granular appearance, but sometimes the radial lines are more prominent. *Epidermis* blackish-brown, persistent on the posterior and ventral margins. *Colour* white. *Interior* white, pearly, with a subvertical sulcus descending from the umbo to the basal margin a little in front of the pallial sinus. *Hinge* with a rather large triangular resilium, and a strong falciform lithodesma. *Adductor-scars* subequal, rather high up. *Pallial line* distant from the margin, the sinus small, convex.

Diameter—Ant.-post., 35 mm. ; dorso-ventral, 30 mm. : thickness, 9·5 mm.

Type in the Mus. Hist. Nat., Paris.

Hab.—New Zealand (" Astrolabe," one left valve only). North Island, and South Island as far south as Preservation Inlet, but more

common in the North; in muddy sand from low-water mark to about 5 fathoms. Kermadec Islands (Captain Bollons).

Maori.—Pakira (*teste* Hutton).

Fossil in the Pliocene.

9. Myodora subrostrata, E. A. Smith, 1880. Plate 55, figs. 16, *a*.

Myodora subrostrata, E. A. Smith, P.Z.S., 1880, 584, pl. 53, f. 6; Hutton, P.L.S. N.S.W., ix, 516; Index, 88. *M. ovata*, Reeve: Hutton, C.M.M., 62; J. de Conch., xxvi, 45; M.N.Z.M., 137. not of Reeve.

Shell subtrigonally ovate, posteriorly subtruncated, subequilateral, fairly solid, the right valve moderately convex, the left valve flat, rather coarsely concentrically ribbed. *Anterior end* sharply curved, slightly longer, the dorsal margin faintly convex, slowly descending; *posterior end* narrowly subtruncated, rather acuminated, the dorsal margin faintly convex, oblique; ventral margin curved and feebly sinuated posteriorly, giving the shell a somewhat rostrated appearance. *Sculpture:* Right valve with a trace of a shallow depression down the posterior side, with somewhat distant, coarse, rounded, concentric ribs; left valve with similar but somewhat closer and sharper concentric ribs; both valves with microscopic dense concentric lines, interrupted by more distant radial lines. *Epidermis* thin, light brown, persistent at the ventral margins. *Colour* dirty-white. *Interior* white, pearly, with a single impressed ray, curving from the umbones to the anterior part of the pallial sinus in the left valve, and a little farther within the valve in the right one. *Margins* smooth, sharp. *Hinge* with a small triangular resilium, and a small pellucid clavicle. *Adductor-scars* unequal, rather high up, the anterior elongate, the posterior round. *Pallial sinus* small, convex.

Diameter — Ant.-post., 18 mm.; dorso-ventral, 14·5: thickness, 5 mm.

Type in the British Museum.

Hab.—New Zealand (Colonel Bolton and Mus. Cuming); Stewart Island (C. Traill); Foveaux Strait, in 15 fathoms; Plimmerton (A. Hamilton); Channel Island, Hauraki Gulf, in 25 fathoms; near Cuvier Island, in 38 fathoms (Captain Bollons).

Fossil in the Miocene and Pliocene.

Fam. CHAMOSTREIDÆ, Fischer.

Animal having the mantle largely closed; a fourth pallial orifice present; pedal orifice small. Siphons very short and separate. Foot small, compressed. Labial palps rather long, obtuse. Gill large, oval, deeply plicated, extending to between the palpi, united behind with the opposite gill, but divided into two parts by a deep oblique groove, the superior part being free and composed of a single gill.

Shell fixed by the right valve, irregular, without a pallial sinus, nacreous inside, with a single cardinal tooth in the left valve; ligament internal, submarginal, with a lithodesma.

Tertiary to Recent.

Genus 1. CHAMOSTREA, F. de Roissy, 1825.

Chamostrea, F. de Roissy, in Blainville, Man. de Malacologie, 1825, 632. Type: *C. albida*, Lamarck. *Cleidothærus*, Stutchbury, 1829.

Shell inequivalve, attached by the front slope of the convex dextral valve; hinge with a small cardinal in the left valve, received into a pit in the right valve; resilium internal, with a long, curved lithodesma.

Distribution.—Australasia; one species only.

Fossil in the Tertiary.

1. **Chamostrea albida**, Lamarck, 1819. Plate 61, figs. 13, *a*.

Chama albida, Lam., A.s.V., vi, 1819, 96; Hanley, Cat. Rec. Biv. Shells, 227. *Chamostrea albida*, Lam.: Reeve, Conch. Icon., xiv, pl. 1, f. 1; Woodward, Fischer, Man. Moll., pl. 23, f. 14; Ad. G.R.M., iii, pl. 98, f. 4; C.M.M., 62; M.N.Z.M., 138; Hutton, P.L.S. N.S.W., ix, 517; Index, 87; Tryon, Struct. & Syst. Conch., iii, 202, pl. 117, f. 16, 17. *Cleidothærus chamoides*, Sowerby, Genera, f. 1–3; Stutchbury, Zool. Journ., v, 1835, 98, pl. 42 bis. *C. albidus*, Lam., A.s.V., ed. 3, ii, 684.

Shell very solid, inequivalve and inequilateral, the right attached valve hollowed, more or less carinated, the left upper valve slightly convex, fulvous, concentrically lamellated. *Beaks* anterior, subspiral. *Anterior end* a little convex, excavated below the umbones; *posterior end* flatly convex, the dorsal margin rounded and descending; ventral margin produced, sometimes sharply angled. *Sculpture* consisting of dense lamellar striæ. *Colour* yellowish-brown. *Interior* light-greenish, somewhat pearly, the posterior margin with a few radiate rays. *Margins* smooth, thick, but sharp. *Hinge* with an erect cardinal tooth in the left valve; resilifer subumbonal, deep, elongated, larger in the right valve, the resilium of the 2 valves connected by a long, curved lithodesma. *Ligament* wanting. *Adductor-scars* unequal, the anterior very high and narrow, the posterior only half as high, broader, oval. *Pallial line* distant from the margin, truncated posteriorly.

Diameter—Ant.-post., 58 mm.; dorso-ventral, 65 mm.: thickness, 35 mm.

Animal.—Hancock, A.M.N.H. (2), x, 1852, 106, pls. 3, 4; Deshayes, P.Z.S., 1853, 167; Hutton, T.N.Z.I., xiii, 204.

Type in the Mus. Hist. Nat., Geneva.

Hab.—North Island of New Zealand, as far as Cook Strait; Chatham Islands: attached to rocks, from low-water mark to about 5 fathoms. Also Australia and Tasmania.

Fossil in the Pliocene and Miocene of New Zealand; Muddy Creek beds, South Australia.

Fam. VERTICORDIIDÆ, Wood.

Animal having the mantle-edges united on the ventral surface, thick, not fringed with papillæ; siphons short, surrounded by a circular fringe of papillæ; foot small, distinctly grooved behind, generally not byssiferous; palps well developed; gills papillose. Marine.

Shell equivalve or very little inequivalve, cordiform, rounded, oval or trapezoidal, inequilateral; the anterior end short; beaks produced, incurved, more or less detached, spiral or subspiral; interior pearly; hinge asymmetrical, with a tooth in the right valve and a corresponding callosity in the left valve; ligament in a subinternal groove, bearing a lithodesma; adductor-scars distant; pallial line entire.

Tertiary to Recent.

Genus 1. VERTICORDIA, Wood, 1844.

Verticordia (Wood MS.), Sowerby, Min. Conch., vii, 1844, 67, pl. 1139. Type: *Cryptodon verticordia*, S. Wood + *Hippagus cardiiformis*, Sowerby. *Hippagus*, Philippi, 1844; not of Lea, 1833. *Cryptodon* (sp.), Wood, 1840; not of Turton, 1822. *Iphigenia*, Costa, 1850; not of Schumacher, 1817. *Hippella*, Mörch, 1861. *Verticordia*, Seguenza, J. de Conch., viii, 1860, 286: Fischer, *op. cit.*, 295: Dall, Bull. Mus. Comp. Zool., ix, 1881, 105; xii, 1886, 285.

Shell small, more or less convex, with a deeply impressed lunule, and a large, arched, bridge-like ossicle attached below the beaks to an internal cartilage in each valve; this ossicle is expanded outward at its posterior end, and in the most typical species is much broader than long; the right valve has a strong conical tooth behind the internal convexity due to the impressed lunule, and no lateral tooth; the left valve has the lunular edge produced to fit in front of the cardinal tooth of the right valve, and has the upper surface of the posterior hinge-margin bevelled away so that that edge may fit under the opposing edge of the right valve; the cardinal tooth in young specimens is grooved axially, but when adult is conical; the line of the external ligament is continued under the spiral of the beaks. (Dall.)

Distribution.—Atlantic, Antilles, Chinese seas, New Zealand, Australia.

Fossil in the Tertiary.

Subgen. 1. HALIRIS, Dall, 1886.

Haliris, Dall, Bull. Mus. Comp. Zool., xii, 1886, 287. Type: *Verticordia Fischeriana*, Dall.

Shell globose, ossicle short, squarish; lunule present, not deep; right valve with a strong conical cardinal and a long lateral tooth; left valve with (in the adult) a small but distinct cardinal tooth and a short stout lateral tooth near the umbo; lunule not produced; adolescent or young shells with the dentition obscure or imperfect. (Dall.)

The type is from the Gulf of Mexico, 84 fathoms.

1. Verticordia setosa, Hedley, 1907. Plate 54, figs. 15, *a*.

Verticordia rhomboidea, Hedley, T.N.Z.I., xxxviii, 1905 (1906), 72, pl. 2, f. 12–14; not of Tate, 1887. *V. setosa*, Hedley, Rec. A.M., vi, 1907, 303.

Shell small, inflated, subrhomboidal, inequilateral, right valve slightly clasping over the left along the dorsal margin, substance very brittle, easily flaking off. *Umbones* incurved, rather distant, usually eroded. *Anterior end* descending abruptly from the umbones, angled below towards the horizontal ventral margin; *posterior end* flatly rounded, the dorsal margin long, convex, very little oblique. *Lunule* slightly excavated; *dorsal area* defined by the radial ribs. *Sculpture:* No incremental growth-lines, about 22 prominent sharp radial ribs which strongly denticulate the margin and imprint the nacreous interior; the surface has everywhere close-set grains which develop minute sharp prickles. *Hinge:* Right valve with a large conical tooth under the lunule, and a posterior lateral beneath the dorsal area; left valve with a minute tooth under the umbo and no lateral; ossicle not found.

Length, 5·75 mm.; height, 5 mm. (type).

Type in the Dominion Museum, Wellington.

Hab.—Off Great Barrier Island, in 110 fathoms (type); near Cuvier Island, in 37 fathoms (Captain Bollons).

Order 4. SEPTIBRANCHIA.

The *Septibranchia* are dimyarian Pelecypods in which the mantle remains fairly open and has 2 sutures and 2 siphons. The foot is long and slender; the byssus rudimentary or absent. The pallial line is simple or very slightly sinuous. The essential character of the group is the disappearance of the gills as respiratory organs, a character which is not found in any other Pelecypod. The gills are transformed into a muscular septum which extends from the anterior adductor muscle to the point of separation of the 2 siphons, and surrounds and is continuous with the foot. The septum, therefore, has exactly the situation and the relations of the branchial septum of the majority of the *Pelecypoda*, which divides the pallial cavity into 2 chambers. The muscular septum is inserted on the shell, especially in the neighbourhood of the 2 adductor muscles; it is pierced by paired orifices, which admit the passage of the water.

The *Septibranchia* are all marine, inhabit considerable depths of the sea, and are carnivorous.

Fam. CUSPIDARIIDÆ, Dall.

Animal having the siphons long and united, their extremities surrounded by tentacles; foot narrow, with a rudimentary byssus; palps greatly reduced or absent; branchial septum pierced by 4 or 5 pairs of very narrow symmetrical orifices. The sexes are separate.

Shell subequivalve, rostrate, earthy, or cellulo-crystalline, rarely with surface granulations; hinge edentulous or with subumbonal tuberculation, sometimes buttressed; resilium internal, with a mesial or ventral lithodesma; area amphidetic or obscure; valves closed, except at the tip of the rostrum; pallial line simple.

Jura to Recent.

Genus 2. Cuspidaria, Nardo, 1840.

Cuspidaria, Nardo, Revue Zool., 1840, 30; Dall, Bull. Mus. Comp. Zool., xii, 1886, 292. Type: *Tellina cuspidata*, Olivi. *Neæra*, Gray, 1833; not of R. Desvoidy, 1830.

Animal with unequal siphons, united at their bases, surrounded by a small number of tentacles bearing cupules at their tips; anal siphon with a tubular valve.

Shell pyriform, white, with an epidermis, a little inequivalve, the right valve being usually a little smaller and less inflated, inequilateral, rounded and globose in front, rostrate and slightly gaping behind; external ligament elongated, linear; resilium in a small spoon-shaped resilifer which is vertical or obliquely directed backward and its hind part confluent with the hinge-plate; the lithodesma distinct, semicircular; teeth of the hinge not constant — a small cardinal tooth sometimes in front of the resilifer, and a posterior lateral tooth usually well developed in the right valve, but obsolete in the left; a reinforcing clavicle descends occasionally from the umbonal cavity; adductor-scars large; pallial line with a feeble sinus.

Distribution.—All seas, but more abundant in the abyssal zone, one species (*C. lucifuga*, Fischer) having been obtained by dredging in 2,731 fathoms.

Fossil. — Secondary and Tertiary. The genus appears in the Eocene of Australia, and very likely migrated to New Zealand.

Key to Species.

A. Shell concentrically finely striated, no radial ridges on the rostrum *Fairchildi.*
B. Shell with concentric sharp laminæ, rostrum radially ridged .. *Trailli.*

1. Cuspidaria Fairchildi, Suter, 1908. Plate 54, figs. 16, *a*.

Cuspidaria Fairchildi, Suter, T.N.Z.I., xl, 1907 (1908), 372, pl. 29, f. 19.

Shell small, thin and fragile, ovate, with a long and straight posterior rostrum, concentrically finely striate, almost equivalve, inequilateral. *Beaks* small, sharply pointed, directed forwards, situate a little in front of half the length; prodissoconch small, roundly ovate, smooth. *Anterior end* narrowly rounded, the dorsal margin slowly descending, straight; *posterior end* produced into a long straight rostrum, gaping at its end; basal margin broadly rounded, slightly concave in front of the rostrum. *Lunular area* very little excavated. *Sculpture* consisting of very fine and dense concentric

striæ, with but little stronger inequidistant marks of rest; the rostrum finely concentrically lamellate, without radial sculpture. *Colour* white, lightly iridescent in some places. *Interior* white, shining, with fine radial striæ. *Margins* smooth. *Hinge-plate* very narrow, slightly buttressed posteriorly, with a small resilifer below the beak; right and left valve with a very small posterior lateral tooth. *Ligament* very small, linear. *Adductor-scars* rather large. *Pallial sinus* not deep, broadly rounded.

Length, 13 mm.; height, 6 mm.; diameter, 4·4 mm.

Type in the Dominion Museum, Wellington.

Hab.—Off Flat Point, in 75 fathoms (Captain Fairchild).

Remark.—This species may be allied to the fossil *C. Kirki*, Hutton (*Neœra Kirki*, Hutt., C. Tert. M., 18), from the Oamaru formation, but the diagnosis is quite inadequate, and the species has not been figured; it is slightly higher in proportion than the Recent species, and somewhat larger (15·5 mm. by 10·25 mm.).

2. Cuspidaria Trailli, Hutton, 1873. Plate 54, figs. 17, *a*.

Neœra Trailli, Hutton, C.M.M., 62; J. de Conch., xxvi, 45; M.N.Z.M., 137; P.L.S. N.S.W., ix, 514. *Cuspidaria Trailli*, Hutton, Index, 87; Hedley, T.N.Z.I., xxxviii, 73, pl. 2, f. 9–11.

Shell small, pyriform with a straight rostrum, slightly inequivalve, the right valve being a little less inflated, moderately ventricose in front, distantly concentrically sharply ridged, rostrum with a few radial riblets, light brown. *Beaks* at about the anterior third of length, not much raised, approximate, directed forwards, the prodissoconch minute, smooth. *Anterior end* short, convex, the dorsal margin straightened, descending; *posterior end* narrowed to a rather long straight rostrum, gaping at the end, the dorsal margin slightly excavated; basal margin broadly rounded in front, a little concave towards the rostrum. *Lunule* obsolete. *Escutcheon* elongate, deeply excavated, broader on the left valve. *Sculpture* consisting of rather distant fine and sharp concentric liræ, the interstices with fine growth-lines; rostrum with a number (5 to 7) of radiate riblets, obliquely descending from the beaks. *Epidermis* light brown, thin. *Colour* white when devoid of epidermis. *Interior* white, with faint radial striæ on the anterior part. *Margins* smooth. *Hinge:* Right valve without cardinal tooth, a small lateral in front of the umbo, and a more prominent distant posterior lateral tooth; left valve without teeth; resilifer small, oblique; a very small lithodesma is present. *Ligament* obsolete. *Adductor-scars* unequal, the posterior larger. *Pallial sinus* not deep, broadly triangular.

Length, 10 mm.; height, 5·5 mm.; diameter, 4 mm.

Type lost.

Hab.—Stewart Island, 14 to 18 fathoms; Dusky Sound (A. Hamilton); off Great Barrier Island, in 110 fathoms; near Cuvier Island, in 38 fathoms (Captain Bollons).

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Class VI. CEPHALOPODA, Cuvier.

The *Cephalopoda* are perfectly symmetrical Mollusca in which the edges of the foot are transformed into circumoral appendages completely surrounding the head, and the epipodium is modified to form an exhalant muscular tube or funnel consisting of 2 free or united lobes, situated behind the head, at the opening of the pallial cavity. In the nevous system all the typical ganglion-pairs are concentrated in the head, and are applied to or contained in the interior of a cartilaginous skeletal piece. The renal organs are constituted by the glandular covering of the afferent branchial vessels. The cœlom communicates with the exterior either directly or by the intermediary of the paired kidneys, and by a second pair of ducts serving as gonaducts. The gonad is situated in the cœlom, and is not continuous with the gonaducts. A portion of the circumoral pedal crown is "hectocotylized"—that is to say, modified to form a copulatory organ in the male. The development is characterized by the incomplete segmentation of the ovum.

In comparing the *Cephalopoda* with other Mollusca, one finds that the ventral surface is much abbreviated and the length of the body reduced. This is the result of the displacement of the foot, whose lateral borders surround the head and are joined together in front of the mouth. In consequence of this shortening of the antero-posterior axis, the two extremities of the digestive canal are closely approximated, and the pallial cavity opens immediately behind the head.

The head is highly developed, but has hardly any other appendages than those formed by the edges of the foot which embrace it. The foot forms a crown of appendages surrounding the mouth, which in the *Dibranchia* have the form of 4 or 5 pairs of symmetrical and generally elongate arms. In the *Octopoda* there are 8 similar arms, and the whole length of the ventral surface of each is covered by suckers, which are often very numerous and highly specialized in structure. In the *Decapoda*, in addition to the 8 arms corresponding to those of the *Octopoda*, there are 2 additional "tentacular" arms, of which one is situated between the third and fourth sessile arms on either side of the posterior part of the head. These 2 tentacular arms are longer and more slender than the others, and the suckers are generally confined to their free extremities, which are enlarged and club-shaped; in some forms, however, they bear suckers along their whole length. The tentacular arms are further distinguished from the sessile arms by the fact that they are more or less retractile within special pouches. In the female *Argonauta* the 2 dorsal arms are enlarged to form a veil, which is applied to the mantle and secretes a protective calcareous shell.

In addition to the foot proper, whose edges constitute the circumoral appendages, the *Cephalopoda* possess an epipodium which is

well developed, but highly specialized to form a funnel. Through this tube the excrements, the secretion of the ink-sac, and the generative products are ejected. The interior of the funnel is generally provided with a larger or smaller valve, attached to its anterior or dorsal face.

In the *Tetrabranchia* the mantle is covered by an external shell. The female *Argonauta* also bears an external shell which covers the mantle, but has no muscular attachments and is not homologous with the shells of other *Cephalopoda:* it does not originate from a preconchylian invagination or shell-gland, but is of pedal origin, and is only formed some ten or twelve days after birth by the palmate extremities of the two dorsal arms. The animal is not attached to this shell. In all other *Cephalopoda* the shell is covered over by the mantle, or at least is partly covered in *Spirula*. The shell, therefore, is internal, and often is rudimentary, as in the majority of *Decapoda*, or it may be nearly obsolete, as in the *Octopoda*. In all living Cephalopods except *Nautilus* the shell is localized on the anterior or physiologically dorsal side of the body, and is enclosed by the mantle, which therefore appears to be a naked bell-shaped sac.

In the *Dibranchia* the mantle is a very muscular organ, which, by its contraction, serves two purposes: by alternately and rhythmically drawing in and forcing out the water that enters the pallial cavity between the funnel and the border of the mantle it acts as an accessory respiratory organ; and by violently expelling water through the funnel it acts as an efficacious locomotory organ, causing the animal to execute sudden retrograde movements.

In the majority of Cephalopods with internal shells (*Decapoda*) and in the *Cirrhoteuthidæ* the mantle is produced into lateral symmetrical expansion or fins of various form and position. These organs always originate at the aboral extremity of the mantle as two triangular or rounded outgrowths.

Beneath the epithelium the integument contains, at least in the *Dibranchia*, chromatophores, or extensible pigment-cells, whose activity produces the remarkable colour-changes characteristic of these animals. The chromatophores are cells originally of ectodermic origin, which sink below the epipthelium and become connected with contractile radiating mesodermic fibres. The pigment-cells are simple, but multinuclear, since they contain secondary nuclei situated at the bases of the muscular fibres. Different cells contain different-coloured pigment: yellow, brown, red, or blue in the *Decapoda*. Each cell exhibits a constant though feeble tremulous movement, and may suddenly be extended, by a reflex action, under the influence of emotion or excitation, or as a more direct result of volition the chromatophores of the same colour may assume a definite condition of contraction or expansion, which gives the body a tint analogous to that of surrounding objects. In the latter case the action of the chromatophores is under the direct influence of the cerebral centres of the nervous system,

and section of one of the optic nerves puts an end to voluntary changes of colour on the same side of the body. The chromatophores are chiefly distributed over the anterior surface (or upper surface when the animal is in its natural position) of the mantle, the head, and the external sides of the arms. In the *Decapoda* there is, in addition to the chromatophores, a layer of reflecting cells which give these animals their iridescent hues.

The digestive tube of the *Cephalopoda* comprises a buccal mass with 2 mandibles and a radula, a long œsophagus, a muscular stomach with pyloric cæcum, and a short intestine which turns forward and opens in the middle line below the funnel.

The buccal aperture, situated in the middle of the pedal appendages, is surrounded by a circular lip garnished with papillæ. Furthermore, in the decapodous *Dibranchia* there is a buccal membrane which may be very extensive and be divided into lobes alternating with the arms, and the lobes may even be furnished with small suckers, as may be seen in some species of *Loligo*.

The buccal cavity, or pharynx, has very thick muscular walls. Internally it is provided with 2 powerful mandibles, one ventral and the other dorsal; the tip of the ventral mandible overhangs that of the dorsal, forming a beak like that of a parrot. These mandibles have recurved insertion plates, to which the large muscles forming the greater part of the mass of the buccal bulb are attached.

As in the *Amphineura*, the *Gastropoda*, &c., the floor of the buccal cavity is occupied by the anterior part of the radula, which issues from a pharyngeal cæcum. Each transverse series of this radula is formed by a median tooth, with 3 symmetrically disposed teeth on either side; the only excep-

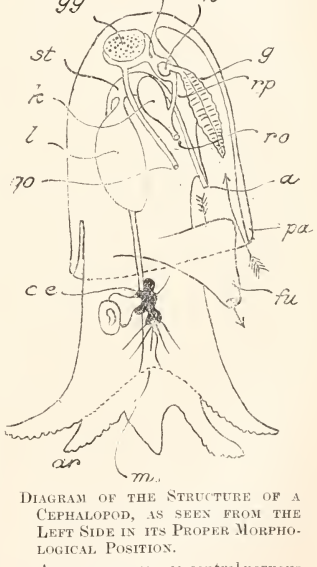

DIAGRAM OF THE STRUCTURE OF A CEPHALOPOD, AS SEEN FROM THE LEFT SIDE IN ITS PROPER MORPHOLOGICAL POSITION.

a, Anus; *ar*, arms; *ce*, central nervous system, with eye; *cœ*, cœlom; *fu*, funnel; *g*, gill; *gg*, gonad; *go*, gonaduct; *h*, heart; *k*, kidney; *l*, liver; *m*, mouth; *pa*, mantle; *ro*, renal orifice; *rp*, reno-pericardial orifice; *st*, stomach.

(After Pelseneer.)

tions to this rule being *Nautilus*, *Gonatus*, and the *Cirrhoteuthidæ*, the latter of which have no radula. In front of the radular prominence is the so-called "tongue," a fleshy projection covered by a somewhat thick papillated cuticle; it corresponds to the subradular organ of other molluscs.

The salivary glands, of which 2 pairs are present in many *Cephalopoda*, pour their secretion into the buccal cavity.

The true stomach is a more or less globular or elongated pouch, with fairly thick muscular walls, and is situated at the summit of the visceral mass; its 2 orifices, the cardiac and the pyloric, are anterior.

The liver is formed by 2 symmetrical glands, which are separate from one another during development, but are generally partially fused together in the adult.

With the exception of *Nautilus*, *Cirrhoteuthis*, *Polypus arcticus*, and *P. piscatorum*, all the *Cephalopoda*, including the fossil Belemnites, have an ink-sac consisting of a highly developed rectal cæcum developed early in embroynic life from the dorsal wall of the intestine and opening into the extreme part of the rectum. This sac is made up of a deeper part, or gland proper, the cavity of which is septate, and a reservoir, into which the glandular part opens by a very small orifice: the reservoir specially well developed in the *Decapoda*. The *Cephalopoda* are able at will to expel the secretion contained in the reservoir of this anal gland through the funnel, and thus conceal themselves by producing a dense cloud in the water. An oxydizing diastase, called tyrasinase, is concerned in the production of the secretion, the latter being known as melanin, or commonly as sepia, the painters' colour, which is chiefly obtained from *Sepia officinalis*, common in the Mediterranean.

The *Cephalopoda*, or at any rate the *Dibranchia*, have a more complete and perfect circulatory system than other Mollusca, the blood being nearly entirely contained in true vessels. The heart is situated somewhat superficially near the middle of the posterior or physiologically ventral surface. It lies in a pericardial cavity, except in the *Octopoda*, in which it is much reduced. The essential part of the heart is the median ventricle, the lateral and symmetrical auricles being nothing more than simple contractile expansions of the efferent branchial vessels.

The branchiæ, or ctenidia, are situated in the pallial cavity on either side of the visceral mass. They originate posteriorly in the embryo, between the mantle and the foot, and afterwards sink in towards the bottom of the pallial cavity, where their axes are inserted, their free ends pointing towards the head. *Nautilus*, the only living representative of the *Tetrabranchia*, has 2 pairs of branchiæ. All other Cephalopods have a single pair of branchiæ, and thus constitute the order *Dibranchia*, much richer in living species than the *Tetrabranchia*.

The cœlom is very extensive, and comprises the gonocœle and the pericardial cœlom; these cavities communicate freely with one another, and are only separated by an incomplete septum, which is atrophied in *Sepia*.

In the *Dibranchia* there are 2 renal capsules, ventral and superficial; these two kidneys are attached to one another in the median line in the *Octopoda*, and they communicate to a greater or less extent with one another in the *Decapoda*, with the exception of *Spirula*.

In all the *Cephalopoda* the essential parts of the nervous system are centralized in the head, round the initial part of the œsophagus: in the *Dibranchia* the nerve-centres are almost completely enclosed in a cartilaginous capsule, and consequently many nerves transverse the cephalic cartilage at their origin.

The eyes are situated on the sides of the head, and are generally sessile. They are, however, pedunculated in many embryos and in some adult forms. In the *Dibranchia* the cavity of the eye is closed, as it is in the majority of *Gastropoda*, and the ocular globe consists of the same essential parts—viz., retina, cornea, and crystalline lens—with various accessory parts added, making it a very complex and perfect organ of vision.

In all the *Cephalopoda* the sexes are separate, and sometimes there is a well-marked sexual dimorphism. As a rule, the males are more slender or smaller than the females. The maximum of sexual dimorphism is found in *Argonauta*, in which genus the males are much smaller than the females; the latter may attain to fifteen times the length of the other sex, and they have an external shell and the characteristic enlargement of the dorsal arms, both of which features are absent in the males. Generally speaking, the males are also distinguished by the phenomenon of hectocotylization, which consists in a curious modification for copulatory purposes of a part of the pedal circumoral crown.

The eggs are laid shortly after copulation. In the *Dibranchia* the eggs are aggregated together, but in the *Octopoda* and in *Sepia*, *Sepiola*, and *Rossia* each egg has a separate envelope, whereas they are united to form longer or shorter gelatinous strings. In *Eledone* only about 60 eggs are laid at one time, in *Polypus* more than 100, and some species of *Loligo* lay more than 40,000 eggs. Some Octopods are incubatory: the female *Argonauta*, for example, protects the eggs in the shell peculiar to her sex.

Of the cuttlefishes, some, like *Argonauta* and *Nautilus*, are characteristic of warm seas, whilst the majority are cosmopolitan, their enormous numbers in the great oceans being only occasionally in evidence by their destruction of fishes on the lines, by the occurrence of their beaks in the stomachs of numerous fishes (from the cod to sharks), and by their forming the chief article of diet of the sperm-whales.

The *Cephalopoda* date back to the Cambrian epoch.

Key to Families and Genera.*

	Suckers sessile, with no horny ring; normally with 8 arms	Octopoda	1
	Suckers stalked, with a horny ring; normally with 8 arms and 2 tentacles ..	Decapoda	9
1	No ear-shaped fins; mantle-aperture single	.. .. ..	2
2	An external shell	Argonautidæ; Argonauta ♀.	
	No external shell	.. .. ..	3
3	Body firm, not soft and gelatinous ..	.. .. ..	4
4	Mantle connection consisting of either deep grooves and ridge, or cartilaginous knobs on the mantle and corresponding hollows at the base of the funnel; aquiferous pores present; hectocotylus involving the whole arm, which is separable ..	Argonautidæ.. ..	5
	Mantle connection consisting of shallow folds on hinder margin of funnel and shallow groove on the mantle; no aquiferous pores; hectocotylus confined to tip of arm, never free	Polypodidæ	7
5	Funnel organ made up of three separate portions; mantle connection cartilaginous; an aquiferous pore at either side of the siphon, none in the head ..	.. .. ..	6
	Funnel organ composed of numerous longitudinal lamellæ; mantle connection composed of membranous folds, without cartilage; an aquiferous pore on either side of the siphon and 2 in the head; hectocotylized arm on the right side ..	Tremoctopus.	
6	Body 30 mm. or less in length, with one ventro-lateral arm developed on an oval sac and specially modified into a separable hectocotylus, which is on the left side ..	Argonauta ♂.	
7	Suckers on the arms in 2 rows	.. .. ..	8
8	A broad fin on either side of the body, rendering the outline heart-shaped ..	Pinnoctopus.	
	No lateral fins, the third arm of right side hectocotylized	Polypus.	
9	A spiral internal shell, protruding on the dorsal and ventral surfaces	Spirulidæ; Spirula.	
	No spiral shell	.. .. ..	10
10	Eye covered by a continuous membranous lid	Myopsida	11
	Eye with a perforated lid	Oigopsida	16
11	Body short, rounded, with separate ovate lateral or subterminal fins	.. .. ..	12
	Body oval or elongate, with fins either marginal or terminal	.. .. ..	13
12	Body short, saccular; medio-dorsal margin of mantle either continuous with head or with cartilaginous connection; right oviduct absent; one ventral or both dorsal arms hectocotylized	Sepiolidæ; Sepiola.	

* After Dr. Hoyle.

13	Fins marginal, extending the whole length of the mantle; body oval 14		
	Fins terminal, together heart-shaped or triangular in form; body cylindrical, more or less pointed behind	Loliginidæ.	
14	A hard cuttle-bone internally	Sepiidæ	15
	A horny pen internally	Sepioteuthis.	
15	No glandular pores on the mantle ..	Sepia.	
16	Some of the suckers modified into hooks		17
	No hooks		19
17	Suckers or hooks in 2 rows; the sessile arms bear only suckers	Onychoteuthidæ ..	18
18	Pen with a very strong keel, visible through the integument of the back as a well-defined dark streak; lateral wings of the pen clearly developed	Onychoteuthis.	
19	Funnel articulating with the inner surface of the mantle by a cartilaginous joint on either side 20		
	Funnel fused with the inner surface of the mantle on either side 26		
20	Animals of gigantic size, mantle 2 to 3 metres in length; tentacle with a fixing-apparatus consisting of alternating pads and suckers extending along the stem; pen feather-shaped with a terminal cone; siphonal articulation unknown ..	Architeuthidæ; Architeuthus.	
	Animal of moderate size; mantle-length not exceeding 0·7 metre, generally much less 21		
21	Articulating facet at the base of the siphon an elongated pit, without a transverse groove; articulating facet on the inner surface of the mantle a linear ridge without any transverse ridge 22		
	Articulating facet on the siphon subtriangular; facet on the mantle with longitudinal and transverse ridge, ⊥-shaped or ⊣-shaped 24		
22	Numerous luminous organs on the ventral aspect of the body, siphon, head, and arms	Histioteuthidæ ..	23
23	Horny rings of arm-suckers without teeth..	Calliteuthis.	
24	Fins usually sagittate, broader than long; siphonal cartilage with longitudinal groove, crossed by a posterior shorter transverse groove: thus, ⊥	Ommastrephidæ ..	25
25	Sucker-bearing portion of the tentacle extending more than half its length ..	Ommastrephes.	
26	Mantle fused with head in nuchal region; no accessory fin; arms with extremities normal. Tentacles (if present) with suckers only, no hooks	Cranchiidæ	27
	Body fusiform, no phosphorescent organs on the eyes; no chitinous tubercles on the mantle	Taonidium.	

Order 2. DIBRANCHIA, Owen.

In these *Cephalopoda* the external surface of the visceral mass is naked, and is only protected by a more or less rudimentary shell, which is situated on the aboral surface, and covered by the integuments of this region. The female *Argonauta* is the only member of the group that has a wholly external shell, but this is not adherent, and is secreted by the dorsal arms. The head of the *Dibranchia* bears 8 acetabuliferous arms, and there is frequently a fifth pair of more or less retractile arms, situated between the third and fourth pair. The funnel is always a completely closed tube. There are 2 branchiæ and 2 kidneys, each of the latter having a pericardial orifice. The cephalic cartilage is traversed by the œsophagus, and encloses all the principal nervous centres. The ocular cavities are closed, and the eyes have a crystalline lens. Chromatophores are present in the integument, and an ink-sac is generally present. The *Dibranchia* include 2 suborders, the *Decapoda* and the *Octopoda*.

Suborder 1. DECAPODA.

In this suborder, in addition to the 4 pairs of normal arms, there is a more or less well-developed "tentacular" arm situated between the third and fourth normal arms, on each side of the head. These tentacular arms are more or less retractile within special pouches, and, as a rule, they only bear suckers at their free extremities. The suckers are pedunculated, and provided with horny rings. The 8 normal arms are shorter than the body. There is generally a fairly well-developed internal shell, and there are usually lateral fins of various width. The heart lies in a cœlomic cavity. Nidamentary glands are usually present.

Tribe 1. OIGOPSIDA.

The members of this tribe are characterized by the presence of a wide orifice, occupying the optic axis, in the external false cornea of the eye. As a rule, 2 oviducts are present. With the exception of *Spirula*, the shell is a chitinous gladius. The *Oigopsida* are the most archiac of the *Dibranchia*.

Fam. SPIRULIDÆ, d'Orbigny.

Animal: Body oblong, with minute terminal fins; mantle supported by a cervical and 2 ventral ridges and grooves; arms with 6 rows of minute cups, tentacular arms elongated; siphon valved.

Shell spiral, whorls on the same plane, not in connection, chambered; chambers connected by a ventral siphon, invested by a series of cone-shaped tubes, 1 for each chamber. The shell is placed vertically in the end of the body, and is held in place by side flaps of the mantle; the 2 dorsal and ventral sides of the aboral extremity of the shell are left uncovered by the mantle.

Genus 1. SPIRULA, Lamarck, 1799.

Spirula, Lamarck, Mém. Soc. H.N., Paris, 1799, 80. Type: *Nautilus spirula*, Linné. *Lituina*, Link, 1806. *Lituus*, Gray, 1849.

Animal as described in the family characters. Three pairs of ordinary, short arms spring from little more than the dorsal half of the branchiferous part of the head; the fourth pair of arms, sexually modified, without acetabula.

Three species have been described, but they cannot be distinguished by the shell alone.

Spirula is not pelagic, but an inhabitant of rather deep water. It belongs to a few principal centres: (1) Between Australia and New Zealand; (2) Banda Sea; (3) West Indies; (4) north-west of Africa, between Madeira and Canaries.

1. **Spirula spirula**, Linné, 1758. Plate 63, fig. 17; Plate 69, fig. 5.

Nautilus spirula, L., Syst. Nat., ed. x, 1758, 710. *Spirula spirula*, L.: Hedley, Bulletin Colon. Mus., i, 48. *S. fragilis*, Lam., Syst. A.s.V., 1801, 102; Gray, Dieff. N.Z., 262. *S. prototypus*, Péron, Voy. Terr. Austral., 1804, pl. 30, f. 4. *S. australis*, Lam., Encycl. Méth., 1816, pl. 465, f. 5; Pritchard and Gatliff, P.R.S. Vic. (n.s.), x, 244. *S. Peronii*, Lam., A.s.V., vii, 1822, 601; Crit. List, 17; M.N.Z.M., 4; Man. Conch. (1), i, 1879, 205, pl. 96, f. 467–69, pl. 105, f. 585; Chall. Rep., xvi, 20, 122; Brazier, Cat. A.M., No. 15, 10. *Lituus lævis*, Gray, Ceph. Antep., Brit. Mus., 1849, 116. *Spirula lævis*, Gray, C.M.M., 4. *S. Peronii*, Lam. *S. australis*, Lam. (= *lævis*, Gray). *S. reticulata*, Owen (= *vulgaris*, Leach), Huxley and Pelseneer, Report on Spirula, Chall. Rep., pt. 83, 1895.

Shell nacreous, calcareous, cylindrical, conical, tapering, involute on the same plane, the whorls separate from each other, and chambered; septa concave outwards, with a shelly funnel-shaped siphon on the inner side, traversing each cell without communicating with each other.

Diameter of the shell, about 20 mm.

Hab.—The shell is found scattered by thousands on the shores of New Zealand, but the animal is very rare indeed. One perfect specimen was collected by Earl, and figured by Mrs. Gray in A.M.N.H.

Fam. **ARCHITEUTHIDÆ**, Hoyle.

Animals of gigantic size, mantle 2 to 3 metres in length; tentacle with a fixing-apparatus consisting of alternating pads and suckers extending along the stem; pen feather-shaped, with a terminal cone; siphonal articulation unknown.

Genus 1. ARCHITEUTHUS, Steenstrup, 1857.

Architeuthus, Steenstrup, Skandin. Naturf. Förhandl., vii, 1857, 182–85. Type: *A. dux*, Stp. *Megaloteuthis*, Kent, 1874. *Dinoteuthis*, More, 1875. *Mouchezia*, Vélain, 1877. *Megateuthus*, Hilgendorf, 1880. *Plectoteuthis*, Owen, 1881. *Steenstrupia*, T. W. Kirk, 1882.

Size large, body cylindrical or spindle-shaped, mostly much narrowed posteriorly. Fins terminal, rhomboidal, belonging to the pos-

terior half of the mantle. Eye-opening with an anterior sinus. Arms without a connecting membrane. Suckers rather close together, their rings denticulated. Tentacular arms very long, the clubs not much expanded. On the median part of the club there are 4 rows of large suckers with denticulated rings, the median ones the largest, diminishing in size distally; at the end of the club a large number of very small suckers with smooth rings. Carpal part of tentacular arms with numerous pads and smooth suckers; this fastening-apparatus extends over a great part of the tentacular arm as somewhat distant pairs of one pad and one sucker. A funnel groove is present. Gladius with rhachis and a feather-shaped vane, which has at the end the margins turned inwards, thus forming a hollow cone.

These Cephalopods attain a very large size: *A. princeps*. Verrill, attains a length, tentacular arms included, of over 40 ft.

Species were recorded from Alaska, Japan, Island of St. Paul, coast of Ireland, Newfoundland, New Zealand.

1. Architeuthus Kirkii, Robson, 1887.

Architeuthis Kirkii, C. W. Robson, T.N.Z.i., xix, 1886 (1887), 155; Index, 58.

Epidermis covered with a great number of minute specks of a bright red-brown colour. Under this the flesh was white and firm. The *body* slender, cylindrical, the sides nearly straight, having a small *caudal fin*, or fins, for they did not extend quite to the end of the tail or unite across the body. The outer edges of these fins, if produced so as to meet, would have formed a perfect oval. The *head* was short and thick, with large *eyes* furnished with a lid, the mouth being armed with a large and powerful *beak*. The 8 *sessile arms* were of equal length (6 ft. 6 in.), but not of equal thickness, though all were thick and strong; 2, those next the tentacular arms, were much stouter than the other 6, being as large at the base as an average man's leg 8 in. above the knee. All the sessile arms were furnished with stalked *suckers*, having a row of incurved teeth, and varying in size from those at the base, with a diameter of 1½ in., to that of a small pea at the point. The *tentacular arms* were long and slender, almost exactly similar to those of *A. Verrilli*, as figured by T. W. Kirk. They had also the same arrangement of small tubercles and suckers, at intervals of 2 ft. from the club to the base. The club differed from that of *A. Verrilli* chiefly in having small suckers on very long stalks placed along the margins between the large ones. The *internal shell* was lanceolate, rather broad, transparent, and brittle when first taken from the body. It was in several pieces, owing probably to its having been broken during the animal's struggles to regain the water.

This Decapod is not similar to any which I have previously met with, or of which I have seen descriptions; it differs chiefly in the shape of the caudal fin, in the large size of two of the sessile arms, in the arrangement of the suckers on the clubs, and in the unusual size of the beak.

The following measurements were taken: Body, from anterior margin of mantle to end of tail, 8 ft. 3 in.; head, from margin of mantle to base of arms, 1 ft. 9 in.; sessile arms, 6 ft. 6 in.; tentacular arms, 18 ft. 10 in.; extreme length, 28 ft. 10 in. The greatest circumference must have been 8 ft., and the number of suckers on the sessile arms over 50.

Hab.—Cape Campbell and the adjacent coasts seem to be places of favourite resort for these great Cephalopods during the winter months, a year seldom passing without one or more of them being cast on shore, usually during the months of June and July. The greater number, however, of these, owing to the attacks of sharks, dog-fish, and porpoises, are stranded in such a mutilated condition as to be of little value to the naturalist. A Decapod when cast ashore is unable to return to the water, as is the case with the Octopods. (C. W. Robson.)

2. **Architeuthus longimanus**, T. W. Kirk, 1888. Plate 64, fig. 1.

Architeuthis longimanus, T. W. Kirk, T.N.Z.I., xx, 1887 (1888), 34, pls. 7–9; Index, 58.

Sessile arms unequal in size and length, increasing from the dorsal to the ventral. First pair (dorsal) shorter than the body, triangular in section, with a stout fleshy membrane on each of the inner angles, the inner one slightly longer than the outer; this membrane can be folded over the suckers. Second pair (subdorsal) longer and stouter than the last, but not equal to the length of the body; rectangular in section, the sides and angles being, however, somewhat rounded, with thick fleshy membrane on each of the inner angles; these membranes are of equal width and strength. A thick crest runs along the outer face of these arms; it rises nearer the upper than the lower angle, and occupies about three-fourths of the face; its depth is nearly the diameter of the arm. Third pair (subventral) still larger in all respects, and rather longer than the body; oval in section, the inner or sucker face being flattened, each angle furnished as in the preceding arms with a fleshy membrane, the outer being slightly more developed than the other. Fourth pair (ventral) very long and exceptionally stout, rather longer than the head and body together; trapezoidal in section; stout fleshy membranes on the inner angles, the outer one the longest. A very stout fleshy crest on the lower posterior angle, and a much longer but slighter on the upper posterior angle.

The arrangement of the *suckers* on the sessile arms is very remarkable. The first (dorsal) pair carried 54 suckers on each arm, disposed, as usual, in two alternating rows; but these suckers were all small. The second had only 47 suckers, but these were very much larger than those on the first pair. The third had 86, about the same size or a little smaller than those on the last pair. The fourth

carried 144, all about the same size as those on the second pair. As in the case of all animals belonging to this section, each sucker was stalked, the stalk being inserted on the side; each sucker is strengthened by a bony ring having a number of sharp teeth on the exposed edge. These bony rings are quite white when first taken from a fresh specimen; but after being in spirit for some time they assume a yellowish horn colour. They are all oblique.

Tentacular arms are very long and slender, more than six times the length of the fourth (ventral) pair of sessile arms, or of the head and body together. The arm is nearly round, and of equal diameter throughout. The clavate portion is triangular, with a membrane on the posterior angle. A large and irregular cluster of small suckers and tubercles at the base of the club; this cluster gradually thins out and extends up the arm, the distance between the individual suckers increasing till they are about 20 in. apart; they then occur at regular intervals, a pair, sucker and tubercle, all up the arms. The larger suckers on the club are arranged in two alternating rows, with smaller intermediate marginal ones on each side.

The *head* is long, and of equal circumference, save a little behind the centre of the eye, where the cephalic cartilage causes a distinct prominence. The eye is prominent, with a well-developed lid and anterior sinus.

The *body* is somewhat contracted a short distance behind the anterior margin, then it increases in circumference to the centre, whence it tapers to the tail.

The *fins* are broad rhomboidal, the posterior extremity produced into a blunt well-developed "tail"; the anterior lateral margins somewhat concave, and produced beyond the insertion, but the produced portion rounded.

The *jaws*, when in position, form a powerful beak, resembling that of some gigantic bird of prey, except that the order is reversed, and in this instance the upper jaw fits into the lower, not lower into upper as is the case with birds. The tips of the jaws are black, which gradually passes into dark brown, and this again into a much lighter shade till the margin is reached, where the brown has quite disappeared and a border of dirty white remains. The palatine lamina is dark brown, becoming lighter toward the margins, which are white. The rostrum is strong, convex, acute, and curved forward, the cutting-edges being concave, not, or but very slightly, notched at the base. The anterior edges of the alæ are uneven, being toothed or chipped all along. The lower mandible is very stout, not so much curved, no notch near the tip, which is acute; cutting-edge straight, with deep notches at the base; succeeding this notch, and just on the anterior edge of the alæ, is a broad prominent lobe or tooth, the edges sloping from this to a depression, whence they rise again before rounding off.

The *teeth of the radula* are in 7 rows, with on each side a marginal row of thin unarmed plates. The teeth are light-horn colour, but become darker in spirit. Those of the median line have 3 fangs, all truncate, the centre one much the largest, the laterals are slightly turned outwards; those of the submedian line have 2 fangs, the inner one being the largest and turned towards the median tooth, while the outer one is slightly inclined towards its sublateral neighbour. The teeth of the sublateral line are acute, stout, and much curved towards the submedian. The laterals are slighter than the last, acute, and also curved inwards.

Measurements.—Total length (including tentacular arms), 684 in.: body—from tip of tail to anterior margin of mantle, 71 in.; circumference 1 ft. from anterior margin, 54 in.; circumference at centre, 63 in.; circumference immediately in front of fin, 45 in.: head—from anterior margin of mantle to root of arms, 22 in.; circumference, 32 in.: eye-socket—long, $5\frac{1}{2}$ in.; deep, $3\frac{1}{2}$ in.: fins—longitudinal, 24 in.; transverse, 28 in.: "tail," 4 in.: tentacular arm—length 591 in.; circumference, $3\frac{3}{4}$ in.: sessile arms—first, 59 in.; second, 62 in.; third, 68 in.; third, circumference, 12 in.; fourth, 95 in.: length of upper mandible, tip to end of palatine lamina, $4\frac{4}{20}$ in.: length, tip to end of frontal lamina, $2\frac{17}{20}$ in.: cutting-edge of rostrum, $\frac{14}{20}$ in.: cutting-edge of ala, $\frac{11}{20}$ in.: tip to lateral border of frontal lamina, $1\frac{7}{20}$ in.: lower mandible—tip to border of mentum, $1\frac{15}{20}$ in.; tip to lateral border of ala, $1\frac{7}{20}$ in.; height of tooth, $\frac{5}{20}$ in. (T. W. Kirk.)

Hab.—Lyall Bay, Cook Strait.

3. **Architeuthus Stockii**, T. W. Kirk, 1882. Plate 65, fig. 1.

Steenstrupia Stockii, T. W. Kirk, T.N.Z.I., xiv, 1881 (1882), 286, pl. 36, f. 2–4; Index, 58.

Body long, slender, almost a cylinder, but very slightly swollen in the middle. *Head* long and narrow, sides nearly straight. *Eyes* large, and furnished with a lid. *Sessile* arms small, all same length and size; *suckers* 36 on each arm, arranged in 2 equal rows, each sucker strengthened by a bony ring, armed with from 40 to 60 sharp incurved teeth. *Tentacular arms* slight; these were torn off at length of 6 ft. 2 in.; no trace of suckers or tubercles on remaining portions.

Fin rhomboidal, posterior, lateral. *Internal shell* lanceolate, furnished anteriorly with 2 lengthened wing-like expansions similar to those at anterior of shell of *Sepia*, and a hollow conical apex $1\frac{1}{8}$ in. deep.

Measurements.—Total length of body and head, 11 ft. 1 in.; length of body, 9 ft. 2 in.; length of head, 1 ft. 11 in.; greatest circumference, 7 ft. 2 in.; circumference of head, 4 ft.; length of sessile arms, 4 ft. 3 in.; circumference of sessile arms, 11 ft.; length of internal shell, 6 ft. 3 in.; width (greatest), 11 ft. (T. W. Kirk.)

Hab.—Lyall Bay, Cook Strait.

4. Architeuthus Verrilli, T. W. Kirk, 1882. Plate 66, fig. 1.

Architeuthis Verrilli, T. W. Kirk, T.N.Z.I., xiv, 1881 (1882), 284, pl. 36, f. 1; Index, 58.

Body short, stout, and nearly round, dilated in the middle. *Sessile arms* unequal in size and length; the first, second, and fourth pairs about same length as body and head together, third pair longer and stouter; all armed with similar *suckers*, but varying in number, the third pair carrying more than either of the others.

Tentacular arms, when extended, nearly three times the length of head and body.

Caudal *fin* obcordate, small dorsal; from tip to front margin about one-third the length of the body; terminating in a blunt point. Suckers stalked.

Measurements.—Length of body and head, 9 ft. 1 in.; length of first, second, and fourth sessile arms, 9 ft.; length of third sessile arm, 10 ft. 5 in.; circumference of body, 9 ft. 2 in.

Special Description.—This specimen was stranded at Island Bay, Cook Strait, on Sunday, the 6th June, 1880. When I reached the spot a very large portion of the tentacular arms had been torn off and carried away by the sea. Mr. James McColl, who was then living near the bay, informed me that he discovered the animal on the beach about 7 o'clock that morning; it was then not quite dead. After recovering from his surprise, he "straightened out the longest feelers and measured them; they were just 25 ft., with broad pieces at the ends. The broad pieces had a row of 15 suckers along each side, and a middle row of 19." The portions of the tentacular arms remaining measured—right, 11 ft. 9 in.; left, 11 ft.; and 7½ in. in circumference. At intervals of about 3 ft. were placed a sucker and a small fleshy tubercle, the sucker on the left arm corresponding with the tubercle on the right.

The first, second, and fourth pairs of sessile arms were of equal length and size—viz., 9 ft. long by 15 in. circumference, each carrying 65 suckers. The third pair, much longer and stouter, was 10 ft. 5 in. in length and 21 in. in circumference, armed with 71 suckers. The suckers were arranged in 2 alternate rows. Along each angle of the arms ran a fleshy membrane about 1½ in. deep, which could be folded over the suckers.

Arms connected by a web 11 in. deep, forming a funnel round the mouth.

Head, 4 ft. 3 in. in circumference, and 19 in. from root of arms to anterior margin of mantle. Eye, 5 in. by 4 in.

Body from anterior margin of mantle to tip of tail, 7 ft. 6 in.: greatest circumference, 9 ft. 2 in.; at anterior end, 6 ft. 4 in.

Fins extending on the back, as in the case of *Onychoteuthis;* length to anterior margin, 36 in.; width, 28 in.

The beak and portions of the skeleton had been extracted by some Italian fishermen, and although an effort was made to trace and procure them it failed. (T. W. Kirk.)

Fam. OMMASTREPHIDÆ, Gill.

Ommatostrephidæ.

Body long, cylindrical; arms short, armed with suckers only; the short tentacular arms non-retractile; siphon valved, united by bands to the head; fins usually sagittate, broader than long; siphonal cartilage with longitudinal groove, crossed by a posterior shorter transverse groove.

Genus 1. OMMASTREPHES, d'Orbigny, 1835.

Ommastrephes, d'Orb., Moll. Viv. et Foss., i, 1835, 412. Type: *Loligo sagittata*, var. *a*, Lamarck. *Ommatostrephes*, Lovén, 1846. *Todarodes*, Steenstrup, 1880.

Body long, cylindrical; arms short, with 2 rows of suckers; tentacles short, not retractile, the clubs with 4 rows of suckers; siphon valved, fastened to the head by bands. Shell, small, lancet-form, with a hollow end-conus.

Distribution.—About five species from all seas. The species are mostly gregarious.

Fossil in the Liassic and Tertiary.

Vernacular Names.—Sea-arrows; flying squids.

1. Ommastrephes Sloanii, Gray, 1849. Plate 66, fig. 2.

Ommastrephes Sloanii, Gray, Cat. Moll. Brit. Mus., Cephalopoda, 1849, 61; C.M.M., 3; Man. Conch. (1), i, 180; M.N.Z.M., 3. *Todarodes* (?) *Sloanii*, Gray, Chall. Rep., xvi, 34; Index, 58. *Ommatostrephes sagittatus Sloanei*, Gray: Pfeffer, "Synopsis der oegopsiden Cephalopoden," 1900, 179.

Body cylindrical; fin rather more than one-third the length of the body; *sessile arms* compressed, cups equal, oblique, in 2 rows, higher side of rings with acute teeth, lower smooth; *tentacular arms* slightly keeled externally, cups of lower part small, in 2 rows, of middle part in 4 rows; rings with distant teeth all round. *Colour* purplish, caused by minute dots placed close together; *beak* black. (Gray.)

Type in the British Museum.

Hab.—West Pacific Ocean, from Japan to New Zealand; Otago; Akaroa; Sumner; Lyttelton; Wellington; Hauraki Gulf.

Remark.—The figure is that of *O. sagittatus*, Lam., which, however, does not differ very much from *O. Sloanii*.

Fam. ONYCHOTEUTHIDÆ, Gray.

Body fleshy, mostly intensively coloured, head and arms well developed, body slender, posterior end tapering to a point, with medium to large fins of transverse rhomboidal shape. Eye with a deep sinus. Transverse and longitudinal folds of the neck well developed; folds on the back of the neck are also present. Funnel with 2 adductors on each side, fused together. Fosse of funnel triangular, deep, bordered by a membrane. Arms angular, with natatory and protecting borders; cups in 2 alternating rows, very often with a tubercle, rings usually smooth. Tentacles with 4 rows of cups in the young, the median rows transformed into hooks as growth proceeds. Valve of funnel slender, pointed in front. Shell horny, lanceolate.

Genus 1. ONYCHOTEUTHIS, Lichtenstein, 1818.

Onychoteuthis, Lichtenstein, Berliner Akademie, 1818. Type: *O. Bergii*, Licht., 1818 (= *Loligo Banksii*, Leach, 1817).

Arms with 2 rows of suckers, the rings of which are not toothed; tentacles thick, their clubs with 2 rows of strong hooks, and at the base a rounded group of suckers, with which they are supposed to unite the two tentacles and use them in conjunction as a *point d'appui* where great strength is required in capturing their prey. Gladius lancet-form, with a conical commencement.

These animals are solitary in habit, frequenting the open sea, and especially banks of gulf-weed. Some of the species have an immense geographical distribution.

1. Onychoteuthis Banksi, Leach, 1817. Plate 66, fig. 3.

Loligo Banksii, Leach, Zool. Misc., iii, 1817, 141; Blainville, Man. Malac., 1825, 367, pl. 3, f. 1. *Onychoteuthis Banksii*, d'Orb. et Fér., Céph. acét., 1839, 332; Ad. G.R.M., iii, pl. 3, f. 4; Man. Conch. (i), 1, 168, pl. 73, f. 291–94; Call. Rep., xvi, 39; Hoyle, "Notes Manchester Museum," No. 18, 1904, 19. *O. Bartlingii*, Lesueur, Journ. Philad. Acad., ii, 1821, 95, pl. 9; Chenu, Man. Conch., i, 30, f. 74; Fischer, Man. Conch., pl. 1, f. 7, 8; C.M.M., 3; M.N.Z.M., 3. *O. Lessoni*, Férussac, Tabl. des Céphalopodes, 1825, 60; Lesson, Voy. Coq., Zool., ii, 1830, 241, pl. 1, f. 3. *O. Bergii*, Lichtenstein, 1818, Zool. Mus. Berlin, 1592, No. 4, pl. 19, f. f–a.

Body very elongate, cylindrical, acuminate behind; head with postero-dorsal, longitudinal, small, prominent ridges; *fins* rhomboidal, the hinder end in the adult moderately produced, so that the fin is wider than long; *sessile arms* conic-subulate, winged on the back, unequal, in length 2, 3, 4, 1; cups with a fleshy excrescence, compressed, pear-shaped; *tentacles* very extensile, the clubs armed with a double series of hooks, of which the outer row is much the largest, with a basal and sometimes an apical group of cups; the carpal fixing-apparatus consists of 7 to 10 suckers and pads; the fifth or sixth proximal hook of the dorsal row is suddenly displaced towards the

ventral row of hooks; the *pen* is dark brown, lanceolate, pennate; in its middle part it has a distinct narrow web, which is not connected with the spoon-shaped cone at the hinder end; the median rib of the rhachis is strongly elevated, rising into a very high and strong keel behind; anteriorly it is much more strongly cornified than the lateral margins, and is clearly perceptible as a sharp dark-coloured line through the integument.

Ordinary length of body, 6 in. (= 153 mm.).

Teeth of Radula.—Fischer, Manuel, 343, f. 123.

Type in the Kgl. Zool. Sammlung, Berlin.

Hab.—Distribution nearly universal: all seas, in the north to Hammerfest, in the south to the Strait of Magellan. Auckland; Wellington.

Fam. **HISTIOTEUTHIDÆ**, Pfeffer.

Body fleshy-gelatinous, epidermis thick, red with numerous chromatophores, and with luminous organs. The general aspect is that of a *Polypus*, with a short conical body, and a large head and brachial apparatus. Fins small or of medium size, extending beyond the posterior end of the body, transverse-oval with deeply notched hinder end. Eyes very large, with large eye-opening, the sinus but faintly indicated. Arms with cups in 2 rows. Tentacles long, three-cornered; club at the end with 4 rows of suckers, more farther down, and one of them with very large cups; fixing-apparatus on the carpal part well developed. Gladius feather-like.

Genus 1. CALLITEUTHIS, Verrill, 1880.

Calliteuthis, Verrill, Amer. Journ. Sci. & Arts, xx, 1880. Type: *C. reversa*, Verrill.

Body short, conical; fins small, united behind the posterior extremity of body; funnel connected with the head by 2 adductors. Arms long, free, without interbrachial membrane, with 2 rows of suckers. Tentacles long and thin, compressed. Horny rings of arms and tentacles without teeth. Dorsal and latero-dorsal arms with 1 row of small and 1 row of large luminous dots; ventro-lateral and ventral arms with 3 rows of luminous organs.

Only one species is known.

1. **Calliteuthis reversa**, Verrill, 1880. Plate 66, fig. 4.

Calliteuthis reversa, Verrill, Amer. Journ. Sci. & Arts, xx, 1880, 393; Ceph. N.E. Amer., 1881, 295, pl. 46, f. 1; Verrill, Second Catal., 1884, 243; Chall. Rep., xvi, 42, 183, pl. 33, f. 12–15. *C. ocellata*, Owen, Ceph. N.E. Amer., 1881, 431.

At Station 168 one immature specimen was taken at the surface by the "Challenger," but its identification is uncertain.

Fam. CRANCHIIDÆ, Gray.

Body of a cuticular or cuticular-gelatinous nature, the arms and fins mostly somewhat fleshy; not much coloured, partly with luminous tubercles round the eyes; in some genera there are chitinous ridges and tubercles on the mantle. Arms mostly of embryonal development, with 2 rows of suckers; club of tentacles with 4 rows, often with a rudimentary or developed fixing-apparatus. Mantle grown together with nape and funnel in three places. The gladius is as long as the body, small, lance-like.

Genus 1. TAONIDIUM, Pfeffer, 1900.

Taonidium, Pfeffer, "Synopsis der oegopsiden Cephalopoden," 1900, 192.
Type: *Procalisthes Suhmi*, Hoyle. *? Procalisthes*, Lankester, 1884.

Body smooth, transparent, chromatophores in 8 transverse rows. Spindle-shaped, widest at the anterior third, posteriorly rather abruptly drawn out into a long point. Fin terminal, one-eighth the length of the mantle, slender oviform, rounded posteriorly, heart-shaped at the base. Head small, eyes pedunculate. Arms small, apparently fleshy, without keels and borders. Suckers spherical, with smooth rings. Tentacles fairly long, not expanded into distinct clubs; 4 rows of suckers, those near the margins smaller; horny rings with 4 bluntly pointed teeth on the high side.

One species only.

1. **Taonidium Suhmi** (Lankester), Hoyle, 1885. Plate 69, fig. 2.

Procalisthes Suhmii, Lankester, Quart. Journ. Micr. Sci. (n.s.), xxiv, 1884, 311, f. 1, 2. *Taonius Suhmii*, Hoyle in Narr. Chall. Exp., 1885, 472, f. 173, 174; Chall. Rep., xvi, 1886, 192, pl. 32, f. 5–11; Index, 57.

The *body* is elongated and fusiform, broadest about one-third back, narrowing gradually forwards and tapering to an acuminate point behind. The *fin* is small, about one-eighth the length of the body, and cordate in form. The *mantle-margin* is directly transverse, and forms three watch-pocket-like openings between its dorsal and lateral attachments, and at each of the latter of these is an oblong semitransparent piece of cartilage-like material. The *siphon* is long, reaching as far as the bases of the arms, and tapering; it opens anteriorly by a transverse slit. The *head* is small and subquadrate, its anterior end being entirely occupied by the bases of the arms, and the hinder portion of its sides by the large pedunculate eyes. The *arms* are unequal, the order of length being 4, 3, 2, 1, and on an average about one-fifth the length of the body; they are slender, tapering, and rounded, and neither keeled nor webbed. The *suckers* are in 2 series, spheroidal, and provided with smooth horny rings. The *tentacles* are about three-fourths as long as the body, slender, cylindrical, not expanded into a distinct club; the extremity bears 4 series of suckers, the marginal ones being a little smaller than the median.

The *suckers* are of quite normal shape, and the *horny ring* both of the median and marginal ones bears 4 strong bluntly pointed teeth. The *surface* is smooth throughout. The *colour* is pale, almost white, and the mantle semitransparent even when preserved, no doubt quite so when living; a number of oblong chromatophores are arranged in about 8 transverse rows. The *gladius*, so far as could be ascertained without extraction, is long, narrow anteriorly, expanded in the posterior half.

Dimensions.—Length, total, 82 mm.; end of body to mantle-margin, 42 mm.; end of body to eye, 45 mm.; breadth of body, 12·5 mm.; breadth of head, 3 mm.; breadth of head across the eyes, 11 mm.; length of fin, 7 mm.; breadth of fin, 4 mm.: length of first arm—right, 5 mm.; left, 5 mm.: length of second arm—right, 6 mm.; left, 6 mm.: length of third arm—right, 8 mm.; left, 8 mm.: length of fourth arm—right, 8·5 mm.; left, 8·5 mm.: length of tentacle—right, 33 mm.; left, 37 mm. (Hoyle.)

Type in the British Museum.

Hab.—One specimen, found washed up on the beach at St. Clair, is in the Otago Museum, Dunedin.

By the "Challenger" Expedition specimens were obtained in the Southern Ocean, due south of Australia (two specimens); between Sydney and Wellington (three young specimens); in the North Atlantic, off the coast of Africa (one small specimen).

Tribe 2. MYOPSIDA.

The members of this tribe are characterized by having a closed external cornea, and by having only a single oviduct—viz., that of the left side. The internal shell has no longer a distinct phragmocone, and is calcified (*Sepiidæ*) or simply chitinous. The *Myopsida* are more littoral in habit than the *Oigopsida*.

Fam. SEPIIDÆ, d'Orbigny.

Body oval, with long lateral fins, uniting behind; mantle supported by cartilaginous tubercles fitting into sockets on the neck and siphon; eyes covered by skin; arms with suckers, tentacular arms entirely retractile; siphon valved. Shell (cuttle-bone, sepion or sepiostaire) broad, flat, thickened internally by numerous plates; terminating behind in a hollow imperfectly chambered apex or mucro, without connecting siphon. Littoral.

Genus 1. SEPIA, Linné, 1758.

Sepia, L., Syst. Nat., ed. 10, 1758, 658. Type: *S. officinalis*, L. *Ascarosepion*, Rochebrune, 1884. *Doratosepion*, Rochebrune, 1884. *Rhombosepion*, Rochebrune, 1884. *Spathiosepion*, Rochebrune, 1884.

General characters those of the family; under the eyes a lid-like fold, over them lachrymal openings; 6 aqueous pores in the buccal

membrane ; arms short ; tentacles long ; suckers long-pedunculated ; siphon with very large valve. Fourth left arm hectocotylized to its base.

This genus is world-wide in its distribution, and includes also ten fossil species from the Oxford Clay, Solenhofen, and a single fossil species from Texas.

Of the thirty Recent species, one-third are known by the shell only.

1. **Sepia apama,** Gray, 1849. Plates 67, 68, 69, figs. 1, *a*.

Sepia apama, Gray, Ceph. Antep. Brit. Mus., 1849, 103 ; C.M.M., 4 ; Man. Conch. (1), i, 1879, 194 ; Chall. Rep., xvi, 1886, 24 ; McCoy, Zool. of Victoria, xix Decade, 1888, pls. 188–90 ; Brazier, Cat. A.M., No. 15, 11 ; Pritchard and Gatliff, P.R.S. Vic. (n.s.), x, 244 ; Index, 58.

Body thick, fleshy, moderately convex on back, more so on ventral side, smooth, broad-ovate, narrowed behind. *Lateral fins* rising a little above the edge of mantle anteriorly, rounded at posterior end, leaving a small, angular, obtusely rounded notch or space with slightly convex intervening portion of body at posterior end. *Sessile arms* short, strong, moderately thick ; order of length—4, 3, 2 = 1, or 4, 2 = 1, 3, or 4, 3 = 2 = 1 ; each with 4 rows of subequal suckers, the compressed horny rim of each of which is set with very numerous, compressed, truncated, fringe-like, short teeth ; fin between arms about one-third of their length to upper pairs of arms, and about half the length of ventral pairs between them and next pair, but nearly obsolete between the bases of two ventral arms. Two *tentacular arms* reaching about twice the length of the club beyond end of body ; club dilated abruptly, auriculate, extended inwards when reflexed (outwards when directed forwards), and obtusely plicated transversely on back, with a short fin on outer (when turned back, inner when turned forward) straight edge ; 5 rows of suckers, 3 outer rows smallest, inner row larger, and median row largest, all with numerous, minute, truncated, fringe-like teeth on compressed horny edge ; 7 or 8 very large cups (counted in the longitudinal direction), with about 3 smaller at base and 5 at apex of same row. *Head* large, transversely oblong, a little less than opening of mantle ; *eyes* very large, with very thick underlid ; a group of 3 to 5 caruncles over each eye, and 2 or 3 smaller ones below, behind middle ; anterior dorsal edge of *mantle* broadly semioval ; ventral moderately concave. *Buccal membrane* with 7 lobes, 1 point between bases of dorsal arms, 1 on each side over bases of next pair of arms, 1 on each side between bases of next pair of arms (or over base of tentacular arms), 1 on each side of base of ventral arms ; lips with numerous small wattles ; *beak* sharp, black. *Colour*, dark purple on back and upper surface of head, paler at sides and base of fins, the narrow outer edges of which are darker ; lower or ventral side paler ; tentacular arms and inner face of sessile arms whitish.

Measurements.—Length from anterior dorsal edge of mantle to interval between fins behind, 8 in. (200·4 mm.); from ventral edge of ditto, 6 in. 7 ln. (168 mm.); width of fins at middle, about 1 in. (25 mm.); width of body without fins, about middle, 4½ in. (113 mm.); length of tentacular arms, 11 in. 6 ln. (292 mm.); length of suckered club, 1 in. 9 ln. (42 mm.); longest (ventral 4th) sessile arm, 6 in. 9 ln. (172 mm.); next (third) pair, 5 in. 6 ln. to 5 in. 8 ln. (140 to 145 mm.); next (second) pair, 5 in. 8 ln. (145 mm.); dorsal (first) pair, 5 in. 8 ln. (145 mm.); depth of fin between dorsal pair, 1 in. 8 ln. (42 mm.); width of head, 3 in. 6 ln. (90 mm.); longitudinal diameter of eye, 2 in. (51 mm.).

Internal Shell.—Elongate-ovate, semioval anteriorly, narrower posteriorly, with slight concavity of sides about one-third from posterior end; anterior two-thirds of midline of back nearly straight, posterior third with a gentle parabolic curve downwards to edge; spine thick, very short, curved downwards or towards ventral edge, not reaching beyond margin of shell; below spine a triangular space, twice as wide as deep, filled with irregular, lacunose, spiny projections or lamellæ, edges radiating from under base of spine; a middle space of upper surface rather more than one-third the width in front, rather less than one-eighth the width at one-fourth the length from posterior edge, convex; separated from lateral, slightly convex-shaped sides by two shallow diverging impressions, disappearing at posterior fourth of length; middle posterior fourth of length covered with coarse, irregular, short, vermicular, tubercular ridges, the sides with striæ arching forwards and outwards. Margins brown and horny at edge, calcareous farther in, narrow in front and at sides of anterior half, becoming wider and forming steep sides posteriorly, united behind; a thick pad at posterior edge of hollow on ventral surface, the portion of which marked with transverse undulating lines of cellular growth is about four-sixths of total marginal length, flattened behind, slightly concave in middle, and convex at sides of front half; anterior two-sixths showing greatest convexity or depth of the shell at its posterior edge.

Length from anterior to posterior edge, 5 in. 10 ln. (147 mm.); greatest width (a little in front of the middle), 2 in. 5 ln. (60 mm.); greatest depth, 7 ln. (15 mm.); length of spine, 1·5 ln. (3 mm.).

Adult shell about 11 in. (280 mm.) long, rather wider behind the lateral concavities, and without spine, which is often absent in much smaller specimens; 16 sutural spaces in 6 ln. (12·5 mm.) near middle of underside of shell. (McCoy.)

Type in the British Museum (sepion only ?).

Hab.—A sepion from New Brighton is in the Canterbury Museum, Christchurch; a partly broken sepion is in the Dominion Museum, Wellington; and an imperfect sepion from Tauranga is in my collection. The type is from Australia.

Fam. **SEPIOLIDÆ**, Leach.

Body short, rounded at the aboral end; fins rounded, inserted on the middle of the length of the body; buccal skin without suckers; tentacular arms completely retractile; the dorsal arms of the first pair are hectocotylized in the male. Head large; eyes large and partly covered by the skin. Shell chitinous, narrow and shorter than the body, or absent.

Genus 1. SEPIOLA, Schneider, 1784.

Sepiola, J. G. Schneider, Samml. verm. Abhandl., 1784, 116. Type: *S. Rondeletii*, Leach. *Fidenas*, Gray, 1849.

Body short, purse-like, mantle united to the head cervically, and ventrally supported by a ridge fitting a groove on the funnel; arms with 2 or 8 ows of pedunculated suckers, the rings of which are not toothed, and 8 rows of very small ones on the tentacular clubs. Fins oval, dorsal. Gladius lancet-form, only half as long as the body, margins thickened. First left arm hectocotylized.

These pretty little cuttlefishes are active creatures inhabiting very various depths of water in the laminarian and coralline zones; they live mostly buried in sand. They are regarded as a delicacy by the Italians.

Only about ten species are known: European seas; Japan; Polynesia; Mauritius; Singapore; and Australasia.

1. Sepiola pacifica, T. W. Kirk, 1882.

Sepiola pacifica, T. W. Kirk, T.N.Z.I., xiv, 1881 (1882), 283; Chall. Rep., xvi, 17, 220; Index, 58.

Body smooth, long bell-shaped. *Fins* moderate, front margin free. *Tentacles* vermiform, as long as head and body together; club thickly and irregularly studded with minute suckers. *Sessile arms* unequal, the ventral or lowest being the largest; all armed with suckers arranged in 2 alternating rows, and extending right to the tip of each arm. *Head* stout, *eyes* prominent. *Colour:* Above, flesh-colour irregularly and profusely spotted and blotched with purple, the ground-colour of the head and anterior part of the body being almost hidden, spots becoming finer as they approach the posterior end of the body; below, pale flesh-colour, spotted as above, but spots much larger and farther apart; the funnel, sides of sessile arms, and under-surface of fins white; tentacles white, with exception of a row of purple spots on the back of the club. (T. W. Kirk.)

Total length, 1·4 in. (35 mm.); length of body, 1 in. (25·5 mm.); length of head, 0·4 in. (10 mm.).

Type apparently lost.

Hab.—Wellington (type); Akaroa Harbour, in 6 fathoms (H. S.); Auckland Harbour, in 4 fathoms (H. S.).

Fam. LOLIGINIDÆ, Leach.

Body rather long; the lateral fins of variable form, and extending the whole length of the body, or only part of it; buccal skin sometimes armed with suckers; the sessile arms have 2 rows of cups, the rings provided with a narrow prominent ridge on the centre of the external surface, the fourth left arm of the male hectocotylized, tentacular arms partly retractile. Inner shell or gladius as long as the back, solid, horny.

Genus 1. SEPIOTEUTHIS, Blainville, 1824.

Sepioteuthis, Blainville, Dict. Sci. Nat., xxxii, 1824, 175. Type: *S. sepioidea*, Blainville. *Chondrosepia*, Leuckart, 1828.

Body rather long or oval, with small lateral fins extending its entire length; siphon attached to the head by muscular bands; buccal skin, with 7 projections covered with suckers; a strong wrinkle behind the eyes. Fourth left arm hectocotylized at its extremity. Gladius feather-like, as long as the back, broader at the middle, its shaft keeled.

Distribution.—About fifteen species in the warm seas: West Indies; Indian Ocean; Red Sea; Australasia; &c.

KEY TO SPECIES.

a. Fins dilated in the middle, buccal membrane without cups .. *bilineata.*
b. Fins dilated posteriorly, buccal membrane with cups .. *Lessoniana.*

1. **Sepioteuthis bilineata,** Quoy and Gaimard, 1832. Plate 70, figs. 1, *a*.

Sepia bilineata, Q. & G., Voy. Astrol., ii, 1832, 66, pl. 2, f. 1. *Sepioteuthis bilineata*, Q. & G.: d'Orbigny, Céph. acét., 1839, 301, Sépioteuthes, pl. 4, f. 2; Man. Conch. (1), i, 154, pl. 63, f. 221; M.N.Z.M., 3; Chenu, Man. de Conch., i, 35, f. 91; Chall. Rep., xvi, 27, 220; Brazier, Cat. A.M., No. 15, 15; Pritchard and Gatliff, P.R.S. Vic. (n.s.), x, 244: Index, 58; H. B. Kirk, T.N.Z.I., xvi, 145, pls. 3–8. *S. major*, Gray, C.M.M., not of Gray.

Body elongated, cylindrical, but flattened on the anterior and posterior surface, attenuated and rounded behind. *Fins* large and thick, most dilated in the middle of the body, extending a little beyond the extremity of the body and coalescing. *Head* broader than long; *eyes* on the sides of the head and directed straight outwards. *Sessile arms* rather short; order of length 4, 3, 2, 1; cups large; rings with short blunt teeth on the higher side. *Tentacular arms* strong, with cups and rings like those of the sessile arms. *Buccal membrane* without cups. *Colour*, yellowish-white, spotted with violet; a blue line on dorsal surface marks the outline of the body; the whole surface of head and body richly spotted with chromatophores. *Shell* lanceolate, widest at about two-fifths of its length, edge not thickened, central rib broad, extended in front about one-sixth of its length. Length of adult about 14 in. (355 mm.).

Anatomy.—H. B. Kirk, *t.c.*, 148, pls. 4–8.

Type in the Mus. Hist. Nat., Paris.

Hab.—Auckland to Wellington, during late spring and summer.

2. **Sepioteuthis Lessoniana**, Férussac, 1826. Plate 70, figs. 2, *a*.

Sepioteuthis Lessoniana, d'Orbigny, Tab. Méth. Ann. de Sci. Nat., vii, 1826, 155: Lesson, Voy. Coq., ii, 1830, 244, pl. 2: d'Orb., Céph. acét., 302, Sépioteuthes, pl. 1, 6, f. 9–14: Gray, Ceph. Antep. Brit. Mus., 1849, 80: Man. Conch. (1), i, 152, pl. 62, f. 212; pl. 64, f. 213: C.M.M., 3: M.N.Z.M., 3: Appelöf, Japanska Ceph., 1886, 31: Chall. Rep., xvi, 27, 151: Index, 58: Brazier, Cat. A.M., No. 15, 14.

Body elongate, spotted with violet; *fins* dilated posteriorly; *sessile arms* elongate, cups oblique, rings with distant acute teeth; *tentacular arms* bluntly clubbed, cups large, very oblique, rings with distant acute curved teeth; *buccal membrane* with cups. *Shell* lanceolate, broadest in the middle, outer edge not thickened, central rib broad, extended in front, one-fifth of the length. (Gray.)

Dimensions of a Specimen from Ternate.—Length, total, 570 mm.: end of body to mantle-margin, 195 mm.: breadth of body, 85 mm.: breadth of fin, 45 mm.: length of first arm—right, 70 mm.; left, 66 mm.: length of fourth arm—right, 95 mm.; left, 100 mm.: length of tentacle—right, 320 mm.; left, 335 mm.

Type in the Mus. Hist. Nat., Paris.

Hab.—Bay of Islands (Antarctic Expedition). Fiji, Ternate (Challenger Expedition); New Guinea; Java; Cape Favre; Trincomalee; Japan.

Suborder 2. OCTOPODA.

These *Dibranchia* have only 8 arms, which are all similar and longer than the body. The body is short and rounded aborally. The suckers are sessile. The heart is not contained in the cœlom. There are no nidamentary glands. The *Octopoda* comprise two tribes, the *Leioglossa* and the *Trachyglossa*.

Tribe 2. TRACHYGLOSSA.

These are *Octopoda* with a radula and without true fins.

Fam. **POLYPODIDÆ**, Hoyle.

Octopodidæ.

Arms long and equal, without a true interbrachial membrane, subulate, elongated. Mantle supported by fleshy bands. No cephalic aquiferous pores. The hectocotylus is not caducous. Formula of radula 3 . 1 . 3.

Genus 1. Polypus, Schneider, 1784.

Polypus, J. G. Schneider, Samml. verm. Abhandl., 1784, 116. Type: *Octopus vulgaris*, Lamarck. *Octopus*, Lamarck, 1798.

Body oblong-rounded, without fins; arms long, unequal, the suckers sessile, in 2 rows on each arm. Third right arm of male hectocotylized.

About fifty species, inhabiting all seas. These animals live mostly hidden in rock-fissures; they are extremely voracious, and feed on bivalves and larger crustaceans.

1. **Polypus Campbelli**, E. A. Smith, 1902. Plate 69, fig. 3.

Polypus Campbelli, E. A. Smith, Voy. "Southern Cross," Moll., 1902, 201, pl. 24, f. 7; Suter, T.N.Z.I., xxxviii, 1905 (1906), 333; Subantarct. Islds. N.Z., i, 1909, 48.

Body short and purse-like, dark, dirty olivaceous upon the dorsal surface and buff beneath; body finely granular above and below, the granules small and very close together on the ventral surface; above each *eye* is a small compressed cirrus. *Arms* (in spirit) keeled above, connected at the base by a short web, all of about the same thickness. The right dorsal is shorter than the left; it has 38 pairs of suckers, the left having 67 pairs. The *suckers* are of moderate size, excepting the seventh pair from the base on the two lateral pairs of arms: these are enormously developed, and stand out 4 mm. from the surface, and are about the same in diameter. It is curious that the upper of the left lateral pair has developed only a single large sucker instead of two. The presence of these large suckers indicate the male sex of the specimen, and this is substantiated by the hectocotylized lower arm of the right lateral pair. This has only 36 pairs of suckers, whereas the corresponding arm on the other side has 75 pairs. (E. A. Smith.

Length from web between dorsal arms to the end of body, 48 mm.; width of body across back, 24 mm.; from back to front, 19 mm.

Type in the British Museum.

Hab.—Campbell Island.

2. **Polypus communis**, J. Park, 1885.

Octopus communis, J. Park, T.N.Z.I., xvii, 1884 (1885), 198; Chall. Rep., xvi, 13, 220; Index, 57.

Body oval, stout, fan-shaped behind, smooth, without fins. *Head* large, long, rounded. *Eyes* large, round, prominent. *Arms* long, tapering, unequal; dorsal pair one-third longer than the ventral pair. The hectocotylus is shorter and more robust than the other arms, ending abruptly in a long, flattened process with a deep longitudinal groove. *Suckers* in 2 rows, not opposite, sessile, tenth sucker in row largest, gradually diminishing both ways; those on dorsal arms one-third larger than those on ventral arms. The suckers vary in number from 138 pairs on the largest arms to 110 on the shortest, while the hectocotylized arm is furnished with only 52 pairs. *Colour:* Above, dark steel-grey, blotched irregularly with pale grey, almost black round the eyes; below, pale grey, blotches smaller and less numerous. (J. Park.)

Measurements.—Length of body and head, 1 ft. 1 in. (330 mm.); length of dorsal sessile arms, 3 ft. (915 mm.); length of ventral sessile arms, 2 ft. (610 mm.); length of hectocotylus, 1 ft. 6 in. (457 mm.); length of other sessile arms, 2 ft. 9 in. (838 mm.); circumference of body, 1 ft. 5 in. (432 mm.); diameter of eyes, 0·5 in. (13 mm.); dia-

meter of largest dorsal sucker, 1·3 in. (33 mm.); diameter of largest ventral sucker, 0·9 in. (23 mm.).

Type was in the Nelson Museum, but was destroyed when the Museum was burnt down some fifteen years ago.

Hab.—Blind Bay, Nelson.

3. **Polypus maorum,** Hutton, 1880.

Octopus maorum, Hutton, M.N.Z.M., 1880, 1; T. J. Parker, Nature, xxxii, 1885, 586; Chall. Rep., xvi, 13, 220; Index, 57.

Body oval, rounded behind, smooth below, roughened but not tuberculated on the back. *Head* slightly granular. *Arms* long, tapering, dorsal pair the longest, ventral pair the shortest; web broad, smooth. *Cups* in 2 rows, close, elevated, those of the eighth or ninth rows the largest, gradually diminishing both ways; those on the dorsal arms largest, twice the diameter of those on the ventral arms. *Colour* dark grey, paler below. (F. W. Hutton.)

Besides the hectocotylization of the third right arm, there is a striking difference between the two sexes which I have not seen mentioned. In the male the suckers simply undergo a gradual diminution in size in passing from the prominal to the distal end of the arm; they retain their characteristic form, and are easily counted up to about half an inch of the tip. In the female, on the other hand, the suckers become quite indistinct for several inches, and in some cases for fully a foot, from the extremity of the arm, taking on the form of small tubercle-like elevations. As an instance of this difference I may mention that in a male specimen with the first left arm 4 ft. 2½ in. (1·284 m.) in length, from 292 to 319 suckers could be readily counted on each arm, while in a female with the corresponding arm of the same length only 90 to 115 could be counted on each arm, the distal portions bearing tubercles so crowded as to make it practically impossible to count them.

The following are the dimensions of the largest specimen (a male) I have measured: Length of body and head, 1 ft. 1 in. (330 mm.): diameter of body, 8 in. (203 mm.): length of arms—first pair, left 5 ft. 5 in., right 5 ft. 3 in. (1,652–1,600 mm.); second pair, left 4 ft. 10 in., right 5 ft. 2 in. (1,474–1,575 mm.); third pair, left 4 ft. 7 in., right 2 ft. 11 in. (1,398–889 mm.); fourth pair, left 4 ft. 3 in., right 4 ft. 8 in. (1,296–1,423 mm.): diameter of largest suckers (on first or dorsal arms), 1¾ in. (39 mm.). (T. J. Parker.)

Radula.—Hutton, T.N.Z.I., xiv, 162, pl. 6, f. A.

Type in the Otago Museum, Dunedin. A small co-type is in the Canterbury Museum, Christchurch.

Hab.—Dunedin (type); Half-moon Bay, Stewart Island (Filhol); Lyttelton; North Shore and Rangitoto Island, Auckland (Cheeseman); Campbell Island (Filhol). Hiding in crevices of rocks at or below low-water mark (Cheeseman).

Genus 2. PINNOCTOPUS, d'Orbigny, 1845.

Pinnoctopus, d'Orb., Moll. viv. et foss., i, 1845, 193, pl. 2. Type: *P. cordiformis*, Q. & G.

Body oblong, with broad, lateral, wing-like expansions, which extend in front and enfold all the body; arms very long, with 2 rows of slightly prominent cups.

New Zealand only.

1. **Pinnoctopus cordiformis**, Quoy and Gaimard, 1832. Plate 70, fig. 3.

Octopus cordiformis, Q. & G., Voy. Astrol., Zool., ii, 1832, 87, pl. 6, f. 3; Dieff. N.Z., 261; Crit. List., 16. *Pinnoctopus cordiformis*, Q. & G., Ad. G.R.M., i, 20; iii, pl. 1, f. 3: Chenu, Man. de Conch., i, 14, f. 35: C.M.M., 1: M.N.Z.M., 2: Chall. Rep., xvi, 14, 220: Index, 57: Suter, Subantarct. Islds. N.Z., i, 1909, 49: Tryon, Man. Conch. (1), i, 128, pl. 40, f. 64.

Body orbicular, tuberculate, winged; *arms* long, nearly equal, lateral ones shortest, with 2 rows of cups; *eyes* rather prominent. *Colour* red-brown; arms with pale-blue lunules.

Total length, 39 in. (990 mm.); length of body, 8 in. (203 mm.).

Type in the Mus. Hist. Nat., Paris.

Hab.—Tasman Bay (type); Hauraki Gulf; Campbell Island (Filhol).

Fam. **ARGONAUTIDÆ**, Cantraine.

Males and females naked or the female with a shell. Arms tapering, very unequal; cups prominent, in 2 series. Aquiferous pores near the head or near the funnel are present. Mantle supported by 2 buttons fitting into grooves at the base of the siphuncle. The hectocotylized arm autotomous.

Genus 1. TREMOCTOPUS, delle Chiaje, 1830.

Tremoctopus, delle Chiaje, Mem. Stor. Nat., 1830. Type: *T. violaceus*, delle Chiaje. *Philonexis*, d'Orbigny, 1835.

Body rounded, head large, band of the neck very small. Funnel short. Two aquiferous pores in the neck. Third right arm hectocotylized, fringed on the sides, and developed in a sack-like aperture on the side of the head.

Radula having the formula 3.1.3.

Distribution.—Atlantic, Mediterranean, Pacific, and Indian Ocean.

1. **Tremoctopus violaceus**, delle Chiaje, 1830. Plate 70, fig. 4.

Tremoctopus violaceus, delle Chiaje, Mem. Stor. Nat., 1830, pl. 70: Vérany, Céph. médit., 1851, 41, pls. 15, 16: Man. Conch. (1), i, 131, pl. 43, f. 86–90; pl. 44, f. 93, 94: Chall. Rep., xvi, 6, 216. *Octopus velatus*, Rang, Mag. de Zool., 1837, 60, pl. 89. *Philonexis velifer*, d'Orbigny, Céph. acét., 1838, 91: Poulpes, pls. 18–20; pl. 23, f. 2–4. *Tremoctopus violaceus*, delle Chiaje: Vérany, Céph. médit., 1851, 41, pl. 14, f. 1.

Body rather ovoid, truncated anteriorly, nearly smooth, violet; *head* short; *aquiferous pores*, 4 on the back of the head and 6 small

ones near each eye; *arms* elongated, order of length 2, 1, 3, 4, two dorsal pairs flattened and webbed to their tips.

Total length, 33 mm.; length of body, 6·5 mm.; length of second pair of arms, 23 mm.; first pair, 15 mm.; third pair, 13 mm.; fourth pair, 13 mm.

Type in the Museo Zoologico, Naples?

Hab.—A specimen was caught near the Great Barrier Island, and identified by Dr. Hoyle. Mediterranean.

Genus 2. Argonauta, Linné, 1758.

Argonauta, L., Syst. Nat., ed. 10, 1758, 708. Type: *A. Argo*, L. *Ocythoe*, Leach, 1817: not of Rafinesque, 1814.

The hectocotylized arm autotomous. The extremities of the dorsal arms are enlarged in the female, and secrete a shell in which the body is contained. The males are very small and naked. Arms subulate. Mantle supported by 2 buttons, fitting into grooves at the base of the siphuncle. The shell is involute, one-celled, brittle, horny, slightly flexible when wet, with a large hemispherical nucleus.

The argonaut swims with great velocity in a reversed position with the siphuncle directed towards the fore part and keel of the shell, and the velated arms firmly embracing the sides of the shell; it also crawls along the bottom by the contortions of its simple arms, holding the shell back upwards with the membranous arms, which are bent backwards; there is no muscular or organic connection between the animal and shell, which, when vacated by the argonaut, floats at the mercy of the waves.

Distribution.—About ten species are known, living in warm seas, and some having a wide distribution.

Fossil in the Pliocene of Italy.

Key to Species.

a. Ribs of shell numerous, close; keel narrow .. .. .. *Argo.*
b. Ribs of shell few and distant; keel broad .. .. .. *hians.*
c. Ribs numerous, tuberculated; keel rather narrow .. .. *tuberculata.*

1. Argonauta Argo (L.). Bolten, 1798. Plate 72.

Argonauta Argo, Linné, Syst. Nat., ed. x, 1758, 708 (in part): Bolten, Mus. Bolten., 1798, 70: Lamarck, A.s.V., vii, 1822, 652: d'Orbigny, Céph. acét., 158, Argonaute, pl. 2, f. 1, 2: Reeve, Conch. Icon., xii, 1861, pl. 3, f. 2: Tryon, Man. Conch. (1), i, 138, pl. 47, f. 111, 112; pl. 48, f. 116, 117: Challenger Rep., xvi, 4, 69: Brazier, Cat. A.M., No. 15, 1: Pritchard and Gatliff, P.R.S. Vic. (n.s.), x, 243: Dall, Bull. Mus. Comp. Zool., Harvard, xliii, No. 6, 226, 227. *A. sulcata*, Lamarck, Syst. A.s.V., 1801, 99. *A. papyracea*, Link, Beschr. Rostock Samml., 1807, 85. *A. haustrum*, Dillwyn, Descr. Cat. Recent Shells, i, 1817, 335 (young shell). *A. naviformis*, Conrad, Journ. Acad. Nat. Sci. Philad., 1854, 2nd ser., ii, 334. *A. Bulleri*, T. W. Kirk, T.N.Z.I., xviii, 1885 (1886), 138, pl. 4; Dall, *t.c.*, 226, 228.

Animal.—*Body* oblong, smooth; *eyes* large, prominent; *arms* unequal, order of length 1, 4, 2, 3; the dorsal pair elongate, second

and third pairs without any internal groove, the third pair depressed their whole length; *siphuncle* united to the base of the arms by a lateral membrane. *Colour* silvery-white or yellowish or with rosy reflections, thickly punctate with red.

Shell compressed, with close prominent bifurcating ribs on the sides and sharp tubercles on the keels; aperture rather narrow. White, keels brownish.

Hab.—North Island of New Zealand; Chatham Islands.

The distribution of this species is almost cosmopolitan; the type is from the Mediterranean.

2. **Argonauta hians,** Dillwyn, 1817. Plate 69, fig. 4.

Argonauta hians, Dillwyn, Descr. Cat. Recent Shells, i, 1817, 334; d'Orbigny, Céph. acét., 1835, pl. 5; Adams and Reeve, Voy. Samarang, Moll., pt. 1, 1848, 4, pl. 3, f. 2; Gray, Ceph. Antep., Brit. Mus. Cat., 1849, 33; Tryon, Man. Conch. (1), i, 136, pl. 46, f. 100–2; Chall. Rep., xvi, 5; Brazier, Cat. A.M., No. 15, 3; Dall, Bull. Mus. Comp. Zool., Harvard, xliii, No. 6, 229. *A. gondola*, Dillwyn, *t.c.*, 335; Adams and Reeve, *t.c.*, 3, pl. 2; Conch. Icon., xii, pl. 4, f. 3. *A. nitida*, Lamarck, A.s.V., vii, 1822, 653. *A. Owenii*, Adams and Reeve, *t.c.*, 4, pl. 3, f. 1. *A. Kochiana*, Dunker, Zeitschr. f. Malak., 1852, 49.

Animal small; head long; ventral aperture large; aquiferous openings 2; *arms* short, unequal, order of length 1, 2, 3, 4; the webbed arms small, thick.

Shell with distant ribs, laterally compressed tubercles on the carina; surface smooth, polished.

Hab.—A shell from Portland Island is in the Otago Museum, Dunedin. Antilles; South Atlantic; Indo-Pacific region.

3. **Argonauta tuberculata,** Shaw, 1790. Plate 71.

Argonauta tuberculata, Shaw, Nat. Hist. Miscell., xxiii, 1790, tab. 995 Bolten, Mus. Bolten., 1798, 71; d'Orbigny, Céph. acét., 1835, 169, Argonaute, pls. 3, 4; Crit. List, 16; M.N.Z.M., 2; Chenu, Man. de Conch., i, 17, f. 45; Chall. Rep., xvi, 4. *A. nodosa*, Solander: Dieff. N.Z., 244; C.M.M., 2; Man. Conch. (1), i, 140, pl. 50, f. 124; Brazier, Cat. A.M., No. 15, 2; Dall, Bull. Mus. Comp. Zool., Harvard, xliii, No. 6, 228; Pritchard and Gatliff, P.R.S. Vic. (n.s.), x, 242. *A. vitrea*, Perry, Conchology, 1811, pl. 42, f. 1. *A. tuberculosa*, Schumacher, Essai d'un Nouv. Syst., 1817, 260; Lamarck, A.s.V., vii, 1822, 632; Reeve, Conch. Icon., xii, pl. 1. *A. oryzata*, Angas, P.Z.S., 1865, 156; 1867, 185: McCoy, Zool. of Victoria, i, vii Decade, pls. 61, 62. *A. gracilis*, T. W. Kirk, T.N.Z.I., xvii, 1884 (1885), 58, pl. 13; Chall. Rep., xvi, 5, 220.

Animal.—Body acuminated behind: *arms* more webbed below than above, unequal; order of length 1, 2, 4, 3; the second and third pairs keeled on the outer side; the second pair depressed.

Shell compressed, thin; sides with transverse rugæ, broken up into tubercles; tubercles of the keels rather sharp, elevated, and sometimes laterally compressed; margin with a spine or "ear" on either side.

Hab.—North Island of New Zealand; Great Barrier Island; Portland Island. Brazil; Indian Ocean; Cape of Good Hope.

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APPENDIX.

LIST OF THE INTRODUCED LAND AND FRESH-WATER MOLLUSCA OF NEW ZEALAND.

1. Lymnoëa stagnalis, Linné.

Helix stagnalis, L., Syst. Nat., ed. 10, 1758, 774. *Limnæus stagnalis*, L.: Forbes and Hanley, Hist. Brit. Moll., iv, 174.

Onehunga Springs. Introduced as food for trout in the River Avon.

2. Limnoëa auricularia, Linné.

Helix auricularia, L., Syst. Nat., ed. 10, 1758, 774. *Limnæus auricularius*, L.: Forbes and Hanley, Hist. Brit. Moll., iv, 169.

An empty shell was found near Wanganui.

3. Hyalinia crystallina, Müller.

Helix crystallina, O. F. Müller, Hist. Verm., ii, 1774, 23. *Zonites crystallinus*, Müll.: Forbes and Hanley, Hist. Brit. Moll., iv, 41.

Auckland.

4. Hyalinia alliaria, Miller.

Helix alliaria, Miller, Ann. Philos. (n.s.), iii, 379. *Zonites alliarius*, Miller: Forbes and Hanley, Hist. Brit. Moll., iv, 34.

In conservatories and hothouses.

5. Hyalinia cellaria, Müller.

Helix cellaria, O. F. Müller, Hist. Verm., ii, 1774, 28. *Zonites cellarius*, Müll.: Forbes and Hanley, Hist. Brit. Moll., iv, 33. *Helix corneofulva*, Pfeiffer, M.H. Viv., v, 145.

This species has been undergoing a great deal of variation, and specialists may be able to separate different varieties, subspecies, and even species of the *cellaria* group.

In gardens, meadows, &c., mostly hiding under stones.

6. Agriolimax lævis, Müller.

Limax lævis, O. F. Müller, Hist. Verm., ii, 1774, 1. *L. brunneus*, Draparnaud, Tabl. Moll., 101; Forbes and Hanley, Hist. Brit. Moll., iv, 20.

A cosmopolitan slug.

7. Agriolimax agrestis, Linné.

Limax agrestis, L., Syst. Nat., ed. 10, 1758, 652. Forbes and Hanley, Hist. Brit. Moll., iv, 20. *L. molestus*, Hutton, T.N.Z.I., xi, 331.

Common in meadows, fields, and gardens.

8. Limax maximus, Linné.

L. maximus, L., Syst. Nat., ed. 10, 1758, 652. *L. cinereus*, Müll.: Forbes and Hanley, Hist. Brit. Moll., iv, 15.

Dunedin (Hutton).

9. Limax flavus, Linné

L. flavus L., Syst. Nat., ed. 10, 1758, 652; Forbes and Hanley, Hist. Brit. Moll., iv, 19. *L. variegatus*, Draparnaud, Tabl. Moll., 1801, 103.

Rather common now; especially injurious to vegetables.

10. Amalia gagates, Draparnaud.

Limax gagates, Drap., Hist. Moll., 1805, 122, pl. 9, f. 1, 2; Forbes and Hanley, Hist. Brit. Moll., iv, 24.

A very variable slug; quite a number of varieties can be distinguished. The following three species have to be included in the *gagates* group :—

11. Amalia antipoda Pfeiffer.

A. antipoda, Pfr., Cat. Pul. Brit. Mus., 177. *Milax antipodum*, Pfr.: Hutton, M.N.Z.M., 26.

12. Amalia fuliginosa, Gould.

Limax fuliginosus, Gould, U.S. Expl. Exp., 5, f. 4.

13. Amalia emarginata, Hutton.

Milax emarginatus, Hutt., T.N.Z.I., xi, 331; M.N.Z.M., 26.

14. Arion empiricorum, Férussac.

A. empiricorum, Fér., Hist. Moll., 1819, 60, pl. 1, f. 1–3; Forbes and Hanley, Hist. Brit. Moll., iv, 7.

Near Auckland and Dunedin.

15. Arion minimus, Simroth.

A. minimus, Simroth, Zeitschr. f. wissensch. Zool., 1885, 2891.

Rangitoto Island; Matahiwi, near Masterton (Mrs. Longstaff).

16. Arion subfuscus, Draparnaud.

A. subfuscus, Drap., Hist. Moll., 1805, 125, pl. 9, f. 8; Forbes and Hanley, Hist. Brit. Moll., iv, 10. *A. incommodus*, Hutton, T.N.Z.I., xi, 331.

Dunedin (Hutton).

17. Arion hortensis, Férussac.

A. hortensis, Fér., Hist. Moll., 1819, 65, pl. 2, f. 4, 6; Forbes and Hanley, Hist. Brit. Moll., iv, 10.

Auckland; plentiful (Musson).

18. Helicostyla tricolor, Pfeiffer.

H. tricolor, Pfr., Man. Conch. (2), vii, 111.

Bay of Islands, in a garden.

19. Helicostyla daphnis, Broderip.

H. daphnis, Brod., Man. Conch. (2), vii, 201.

Picton (Kinsey).

20. Helicostyla fulgetrum, Broderip.

H. fulgetrum, Brod., Man. Conch. (2), viii, 12. *Bulimus antipodarum*, Gray, Dieff. N.Z., 247; Ereb. & Ter., pl. 1, f. 5.

The specimen which was collected by Dr. Dieffenbach, and was in the British Museum, is lost.

21. Helicella caperata, Montagu.

Helix caperata, Mont., Test. Brit., 430, pl. 11, f. 11; Forbes and Hanley, Hist. Brit. Moll., iv, 59; Man. Conch. (2), iv, 14.

Nelson; Paekakariki.

22. Vallonia excentrica, Sterki.

V. excentrica, Sterki, Man. Conch. (2), viii, 249, pl. 32, f. 6–9.

Auckland.

23. Helix aspersa, Müller.

H. aspersa, O. F. Müller, Hist. Verm., ii, 1774, 59; Forbes and Hanley, Hist. Brit. Moll., iv, 44; Man. Conch. (2), iv, 235.

Common at most of the sea-coast towns, and a great nuisance in gardens.

24. Helix hortensis, Müller.

H. hortensis, O. F. Müller, Hist. Verm., ii, 1774, 52; Man. Conch. (2), iv, 123.

Auckland (Hutton).

25. Cæcilianella acicula, Müller.

Buccinum acicula, O. F. Müller, Hist. Verm., ii, 1774, 150. *Achatina acicula*, Müll.: Forbes and Hanley, Hist. Brit. Moll., iv, 130.

Auckland (H. S.).

26. Cionella lubrica, Müller.

Helix lubrica, O. F. Müller, Hist. Verm., ii, 1774, 104. *Zua lubrica*, Müll.: Forbes and Hanley, Hist. Brit. Moll., iv, 125.

Auckland (H. S.).

27. Testacella Maugei, Férussac.

T. Maugei, Fér., Hist. Moll., 1819, pl. 8, f. 10, 12; Conch. Icon., ii, pl. 161, f. 7–10. *Daudebardia novæ-zealandiæ*, Pfr.: Hutton, T.N.Z.I., xiv, 152; not of Pfeiffer. *Testacella vagans*, Hutton, T.N.Z.I., xv, 140.

Found in gardens in the vicinity of Auckland.

28. Aneitea Graeffei, Humbert.

A. Graeffei, Humbert, Mém. Soc. Phys. Hist. Nat. Genève, v, 1864, 116; W. Pfeiffer, Zool. Jahrb., Anat., xiii, 1900, 293.

This slug, a native of Queensland and New South Wales, was found at Port Chalmers by Dr. C. Chilton, and near Collingwood by Mr. J. Dall.

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BRACHIOPODA.

Fam. TEREBRATULIDÆ.

Genus 1. Magellania, Bayle, 1880.

Waldheimia, King, 1850; not of Brullé, 1846 (Insecta).

1. **Magellania lenticularis**, Deshayes, 1839.

Terebratula lenticularis, Desh., Revue Zool. Soc. Cuv., 1839. 359; Sowerby, Thes. Conch., i, 1846, 360, pl. 72, f. 108–10; Conch. Icon., xiii, pl. 2, f. 4. *Waldheimia lenticularis*, Desh.: Gray and Woodward, Brit. Mus. Cat. Brachiopoda, 1853, 58; Hutton, M.N.Z.M., 176; Davidson, Trans. Linn. Soc., iv, pt. i, 1886, 52, pl. 9, f. 2–13.

Shell large, orbicular, elongated oval, globose, longer than wide, thick, rounded laterally, less so in front. *Dorsal valve* uniformly convex or slightly depressed at or close to the frontal margin. *Ventral valve* deeper and a little more convex than the dorsal one, and slightly longitudinally carinated; *beak* rather sharply incurved, overlying the umbo of the opposite valve, and truncated by a small circular foramen, separated from the hinge-line by a wide, narrow, concave deltidium in two pieces; beak-ridges very sharply defined. *Surface* smooth, marked by concentric lines of growth, punctate. *Colour* pinkish-red or yellowish-horny. *Loop* simple, long, and reflected; *cardinal process* rather large and prominent; under it a mesial septum extends to about one-third of the length of the valve on either side the adductor and other muscular scars. (Davidson.)

Length, 55 mm.; breadth, 48·7 mm.; depth, 31·8 mm.

Hab.—Foveaux Strait, in 15 fathoms; Cook Strait to Stewart Island.

Fossil in the Pleistocene.

Genus 2. Terebratella, d'Orbigny, 1847.

1. **Terebratella sanguinea**, Leach, 1814.

Terebratula sanguinea, Leach, Zool. Misc., 1814, 76, pl. 33. *T. cruenta*, Dillwyn, Descript. Cat. Rec. Shells, ii, 1817, 295. *T. zelandica*, Deshayes, Revue Zool. Soc. Cuv., 1839, 359. *T. rubra*, Sowerby, Thes. Conch., i, 1846, 345, pl. 68, f. 9–11. *Terebratella Evansii*, Davidson, P.Z.S., 1852, 77, pl. 14, f. 7–9 *T. cruenta*, Dillwyn: Hutton, M.N.Z.M., 176; Davidson, Trans. Linn. Soc., iv, pt. ii, 1887, 87, pl. 14, f. 1–8.

Shell rather large, somewhat subpentagonal, transverse, ventricose, longer than broad. *Dorsal valve* convex, channelled longitudinally along the middle by a well-defined flattened mesial sinus or depression. *Ventral valve* deeper and more convex than the opposite one, with a longitudinal mesial fold of moderate breadth and elevation, somewhat flattened, extending from the beak to the front; margins

flexuous both laterally and in front; *beak* incurved and truncated by a large circular foramen, separated from the hinge-line by a deltidium in two pieces; beak-ridges not very sharply defined. *Surface* of valves radiately costellated; ribs narrow, numerous, increasing in number at various distances from the beak and umbo through bifurcation and the interpolation of smaller and shorter riblets between the larger ones; surface of valves crossed at various distances by concentric lines of growth. In the *interior* of the dorsal valve the cardinal process and hinge-plate are large and well defined; the mesial septum, of low elevation, extends to half or a little more of the length of the valve. *Loop* large, doubly attached, the principal stems, before attaining their greatest length, give off a flat oblique lamella, which becomes fixed near the anterior extremity of the septum, the lamella proceeding again and doubling in the shape of a loop. *Colour* sanguineous or paler red, deepest in intensity at the lines of growth. (Davidson.)

Length, 4·65 mm.; breadth, 48·5 mm.; depth, 29·5 mm.

Hab.—Cook Strait to Stewart Island.

Fossil in the Pliocene.

2. Terebratella rubicunda, Sowerby, 1846.

Terebratella sanguinea, Quoy and Gaimard, Voy. Astrol., Zool., iii, 1834, 556, pl. 85, f. 7, 8; not of Leach. *T. rubicunda*, Sow., P.Z.S., 1846, 92; Thes. Conch., i, 1846, 351, pl. 70, f. 45–47; Hutton, M.N.Z.M., 177; Davidson, Trans. Linn. Soc., iv, pt. ii, 1887, 84, pl. 15, f. 15–29. *T. inconspicua*, Sow., P.Z.S., 1846, 93. *Waltonia Valenciennesi*, Davidson, A.M.N.H. (2), v, 1850, 475, pl. 15, f. 1.

Shell somewhat orbicular or triangularly ovate, widest about the middle, acuminated posteriorly; *dorsal valve* moderately convex, channelled along the middle by a broad concave sinus, commencing at the umbo and extending to the front, where it is produced a little beyond the lateral curved margins of the valve; marginal line flexuous on the sides. *Ventral valve* deeper than the dorsal one, with a convex well-defined mesial fold extending from the extremity of the beak to the front; *beak* incurved and truncated by a large circular foramen, lying close to the umbo or just separated from it by 2 rather large deltidial plates that barely meet in the middle; beak-ridges sharply defined. *Surface* of valves either entirely smooth or more rarely with small short rounded ribs commencing at a short distance from the lateral and frontal margins of the valves; surface of valves crossed by concentric strongly marked lines of growth. In the *interior* of the dorsal valve the hinge-plate is well defined, with a cardinal process at its posterior extremity. A mesial septum of small elevation proceeds from the base of the hinge-plate to about one-half the length of the valve. *Loop* doubly attached, first to the base of the hinge-plate, and then by a transverse lamella proceeding from about the middle of the length of the principal lamella to the anterior extremity of the septum, when, after again extending a little

farther the lamellæ become reflected and united. *Colour* pale or deep red, sometimes colourless. (Davidson.)

Length, 27·5 mm.; breadth, 25·4 mm.; depth, 14·8 mm.

Hab.—Common. Chatham and Auckland Islands.

Fossil in the Pliocene.

Fam. RHYNCHONELLIDÆ.

Genus 1. Hemithyris, d'Orbigny, 1847.

1. **Hemithyris nigricans**, Sowerby, 1846.

Rhynchonella nigricans, Sow., P.Z.S., 1846, 91; Thes. Conch., i, 1846, 342, pl. 71, f. 81, 82; Hutton, M.N.Z.M., 178; Davidson, Trans. Linn. Soc., iv, pt. ii, 1887, 169, pl. 24, f. 16–19 *Hemithyris nigricans*, Sow.: Dall, Proc. Acad. Nat. Sci. Philadelphia, 1873, 196.

Shell somewhat tetrahedral, wider than long. Hinge-line obtusely angular. *Dorsal valve* convex, divided into 3 lobes, of which the central one forms a broad slightly raised mesial fold. *Ventral valve* rather less deep or convex than the dorsal one, with a broad mesial sinus commencing at about a third of the length of the valve and extending to the front; *beak* pointed and slightly incurved; foramen longitudinally oval, incomplete, and situated under the extremity of the beak, margined anteriorly by a small portion of the umbo and laterally by narrow deltidial plates; beak-ridges tolerably well defined, leaving between them and the hinge-line a narrow triangular flattened space. *Surface* of valves ornamented by a variable number of angular ribs, from 20 to 25 on each valve, a few of which are due to interpolation, while from 5 to 6 occupy the fold and sinus. Surface of valves crossed by numerous concentric lines, or projecting ridges, of growth. *Colour* bluish or brownish black; shell-structure fibrous, impunctate. The *apophysary system* consists of 2 short curved lamellæ. (Davidson.)

Length, 23·3 mm.; breadth, 27·5 mm.; depth, 14·8 mm.

Hab.—Five miles east of Ruapuke Island, in 19 fathoms, on rock and coral (E. J. Evans, R.N.). From Great Barrier Island to Stewart Island, but more common in the South. Chatham Islands.

Fossil in the Miocene and Pliocene.

ADDITIONS AND EMENDATIONS.

Laoma (Phrixgnathus) Celia, Hutton, n. subsp. **levis.**

This subspecies is slightly smaller than the species, of a higher polish, the brown colour-markings more distinct, forming zigzag lines, and always extending over the base; the microscopic spiral liræ are absent or exceedingly faint; the spire is more depressed, equalling in height that of the aperture, and the perforation is slightly narrower.

Diameter, 3·5 mm.; height, 2 mm.

Type in my collection.

Hab.—Pipiriki, Wanganui River (Mrs. G. B. Longstaff).

Laoma (Phrixgnathus) Celia, Hutton, n. subsp. **alboviridis.**

The microscopic spiral lines are present and very distinct, as in the species, but there is an almost total absence of all colour-markings, the whole shell having a greenish-white colour, with sometimes a few indistinct light-brown radiate streaks on the earlier whorls; the epidermis is not shining, and the aperture and spire are of about the same height.

Diameter, 3·3 mm.; height, 2·2 mm.

Type in my collection.

Hab.—Mount Alfred, Otago (Mrs. G. B. Longstaff).

Plaxiphora superba, Pilsbry. Plate 32, fig. 11.
Plaxiphora obtecta, Pilsbry. Plate 32, fig. 10.
Spongiochiton productus, Pilsbry. Plate 32, fig. 9.

The figures of these three species are reproduced from photos taken from the types in the British Museum, and kindly sent by Mr. Edgar A. Smith, I.S.O.

Dr. Joh. Thiele published in "Zoologica," xx, Heft 56, 1909–10, a revision of the system of the Chitons, and from the pen of T. Iredale appeared three papers in the P. Mal. S., ix, pts. 1–3, 1910, dealing with the marine Mollusca from the Kermadecs and the Australasian *Polyplacophora*. From these publications the following notes are taken :—

Ischnochiton Parkeri, Suter, 1897.

Iredale (*l.c.*, 91) identifies with this species *Tonicia Gryei*, Filhol, 1880; *Lepidopleurus melanterus*, Rochebrune, 1883; *Ischnochiton fulvus*, Suter, 1905, and proposes Filhol's name for the species. Neither Filhol nor Rochebrune have given figures of their species, so my name may stand. Iredale remarks, "Thiele, having examined

these same shells, has declared the identity of *Parkeri*, Suter, and *fulvus*, Suter, with them." This Thiele most decidedly has not done, and I still consider the two species as distinct.

Ischnochiton granulifer, Thiele, 1910.

Ischnochiton granulifer, Thiele, "Zoologica," xxii, Heft 56, 1910, 83, pl. 8, f. 31–35.

In size and general appearance similar to *I. luteoroseus*, Suter. One specimen is uniformly yellowish, the other whitish, indistinctly marbled, and with a few symmetrical reddish-brown spots near the lateral margin. The valves are rather strongly convex, angled at the middle, sides convex. The whole surface is covered with roundish granules, the lateral areas are hardly defined, the tail valve has a central mucro with a concave posterior slope. Head valve with 13, tail valve with 8, slits. The minute scales of the girdle beset with numerous small globules fastened to a thin stalk. Marginal bodies symmetrically striated.

Length, 6 mm.; breadth, 3·5 mm.

Type in the Kgl. Zoolog. Sammlung, Berlin.

Hab.—The two specimens were collected in New Zealand by Dr. Thilenius, no exact locality being given.

Plaxiphora biramosa, Quoy and Gaimard, 1835.

Thiele, who has examined the type specimens, says that I recognized the true *P. biramosa*, and he gives (*l.c.*, 27) an amended diagnosis of the species.

Iredale (*l.c.*, pt. 2, 93) includes *Tonicia corticata*, Hutton, as a synonym, and he is most likely right. The type of Hutton's species seems to be lost, and I placed it as a synonym under *Acanthopleura granulata* after Hutton assured me that a much-damaged shell of the latter which I showed him was really his *T. corticata*.

Plaxiphora cælata, Reeve, 1847.

Iredale (*l.c.*, pt. 2, 92) records the details of the types of *P. cælata* and *P. terminalis*, E. A. Smith, and he mentions that the latter fully agrees with the description and figures of *P. Schauinslandi*, Thiele.

Plaxiphora terminalis, E. A. Smith, 1874.

Chiton (*Plaxiphora*) *terminalis*, E. A. Smith, Ereb. & Ter., 4, pl. 1, f. 13. *Plaxiphora Schauinslandi*, Thiele, "Zoologica," xxii, Heft 56, 1909, 28, pl. 3, f. 41–43.

The species is distinguished from *P. cælata* by its larger size, the more distinct mucro of the intermediate valves, the slightly finer sculpture, the more elevated sutural laminæ, and the deeper sinus, which is convex, but almost straight in *P. cælata*. It may be classed as a subspecies of the latter.

Plaxiphora albida, Blainville, 1825.

Chiton albidus, Blainv., Dict. Sci. Nat., xxxvi, 1825, 547 : Man. Conch. (1), xv, 105. *C. glaucus*, Quoy and Gaimard, Voy. Astrol., Zool., iii, 1835, 376, pl. 74, f. 7–11. *? C. petholatus*, Sowerby, M.N.H. (n.s.), iv, 1840, 289; var. *porphyrius*, Sow., *l.c.* *Chætopleura conspersa*, Adams and Angas, P.Z.S., 1864; 1865, 187. *Plaxiphora albida*, Blainv.: Thiele, "Zoologica," xxii, Heft 56, 1909, 24, pl. 3, f. 22, 23; Iredale, P. Mal. S., ix, 98. *P. tasmanica*, Thiele, *l.c.*, 25, pl. 3, f. 24–26. *P. Bednalli*, Thiele, *l.c.*, 25, pl. 3, f. 27–31.

Thiele and Iredale use the earlier name of *albida*, Blainv., for the shell commonly known as *P. glauca*, Q. & G., but, as the former was not figured, the latter can still be retained.

Plaxiphora superba, Pilsbry, 1893.

Thiele (*l.c.*, 27) mentions that the largest figure of *P. biramosa*. Q. & G., in Voy. Astrol. is this species, which erroneously usually went under the latter name. He also says that he is unable to separate it from *P. Campbelli*, Filhol, and *P. subatrata*, Sut. He and Iredale (*l.c.*, 95) use Filhol's name, but for reasons already stated I use Pilsbry's name *superba*.

Plaxiphora obtecta, Pilsbry, 1893.

Plaxiphora Suteri, Pilsbry: Thiele, *l.c.*, 29, pl. 3, f. 48, 49. *P. obtecta*, Pilsbry: Iredale, *l.c.*, 92.

With regard to the synonym *Mopalia ciliata*, Sow., of Hutton's Manual, Iredale says, "In that place Hutton quotes Reeve's figure and copies Reeve's description. Reeve figured a shell like *cælata*, and states New Zealand (Earl). No one could confuse Reeve's figure with the shell under notice, and I would transfer *Mopalia ciliata*, Sow., of Hutton's Manual, 116 (not of Sowerby), to *cælata*, Reeve." Last year I had an opportunity of examining Reeve's figure, and I fully agree with Iredale.

Plaxiphora egregia, H. Adams, 1866.

Fremblya egregia, H. Ad., P.Z.S., 1866, 445, pl. 38, f. 9. *Plaxiphora egregia*, H. Ad., Man. Conch. (1), xiv, 331, pl. 65, f. 80–82; Iredale, P. Mal. S., ix, 1910, 93. *Acanthochætes ovatus*, Hutton, T.N.Z.I., iv, 1872, 182; M.N.Z.M., 177. *Plaxiphora ovata*, Hutton, Man. Conch. (1), xiv, 332, pl. 54, f. 34–40; Suter, P. Mal. S., ii, 192; Iredale, T.N.Z.I., xl, 375, pl. 31, f. 1 (abnormal specimen). *Fremblya ovata*, Hutton: Thiele, *l.c.*, 29, pl. 3, f. 50–52.

Fremblya egregia, H. Adams, described and figured in 1866 from "unknown habitat," appears to have received very little attention since. In 1872 Hutton described a New Zealand shell as *Acanthochætes ovatus*.

In 1893 Pilsbry included both under *Plaxiphora*, reducing *Fremblya* to sectional rank. To *egregia* he allotted an Australian habitat on Carpenter's MS.—"Collected by Dieffenbach, Newcastle, Aus-

tralia"—and as a synonym gave *Streptochiton tortuosus*, Cpr. MS. *olim*. He also gave Carpenter's manuscript detailed description of the type. In the British Museum are the type tablet and three other tablets, one marked "Newcastle, Australia, Dieffenbach," and the two others "From New Zealand." All these last three are labelled "*S. tortuosus*, Cpr.," in Carpenter's handwriting.

As Dieffenbach collected largely in New Zealand, I consider it feasible to suppose that an erroneous label has been attached to the shells, as otherwise it is unknown from Australia, and I do not consider it should be included in Australian lists.

There can be no doubt that all the specimens are conspecific, and as *egregia* has priority it must replace the familiar *ovata*.

Thiele has reinstated *Fremblya* as a full genus, but I cannot yet see characters sufficiently strong to cause me to follow him. (T. Iredale.)

Spongiochiton productus, Pilsbry.

Thiele (*l.c.*, 36) examined the type, lent by the British Museum, and arrives at the conclusion that it does not differ very much from *Loboplax*. Iredale has also studied the species (*l.c.*, 100), and ascertained that *Acanthochites Carpenteri*, Pilsbry, Man. Conch. (1), xv, 35, pl. 1, f. 14–22, is a synonym. For the latter species the habitat given is Port Elizabeth, South Africa, which most likely is correct, and the species has to be omitted from the list of New Zealand shells.

Acanthochites (Loboplax) Mariæ, Webster, 1908.

Thiele described a new species as *Loboplax stewartiana*, n. sp. ("Zoologica," xxii, Heft 56, 1909, 37, pl. 5, f. 8–12), from a specimen collected by Filhol at Stewart Island, which is in the Muséum Hist. Nat., Paris.

I compared specimens of Webster's species with Thiele's description and figures and came to the same conclusion as Iredale (*l.c.*, 102), that the two are conspecific.

Webster's name has priority, but the habitat, Stewart Island, is new.

Acanthochites Thileniusi, Thiele, 1909.

Acanthochites Thileniusi, Thiele, "Zoologica," xxii, Heft 56, 1909, 50, pl. 6, f. 54–60; Iredale, P. Mal. S., ix, 155.

Valves whitish with a dark-olive longitudinal streak on each side of the central area, the lateral areas and the end valves mostly blackish-olive, now and again with whitish spots. Girdle with white and olive spicules. The valves are regularly arched. Jugal area longitudinally striated, the granules of the latero-pleural areas rounded, small, crowded. The tegmentum of the intermediate valves is considerably broader than long, in the proportion of 7 : 4,

nearly straight anteriorly, the apex but little advancing behind; the sutural laminæ are fairly broad, the sinus moderately broad. The anterior margin of the articulamentum of the head valve is descending. The tail valve has the tegmentum much broader than long (12 : 7), with the mucro slightly behind the middle and forming a blunt angle; articulamentum descending abruptly, the posterior margin slightly sinuated. Girdle broad, with short and thick calcareous spicules, the bristles of the sutural tufts also short and thick.

Length, 18 mm.; breadth, 10·5 mm.

Type in the Naturhist. Museum, Bremen.

Hab.—Tauranga (Dr. Thilenius).

Remarks.—Thiele states that the species is very distinct from *A. zelandicus*, and nearest to *A. armatus*, Pease, from the Hawaiian Islands. Iredale, however, would consider it the same as *A. tristis*, Roch., an Australian species.

Chiton Stangeri, Reeve, 1847.

Iredale has examined the type of this species in the British Museum, and found it to be identical with *C. canaliculatus*, Q. & G., as suggested by Hutton and accepted by Pilsbry.

Chiton Suteri, Iredale, 1910. Plate 2, fig. 19; Plate 4, fig. 13.

Chiton Suteri, Iredale, P. Mal. S., ix, pt. 2, 1910, 102. *C. Stangeri*, Reeve, *antea*, p. 40, not of Reeve.

The diagnosis printed on p. 40 is valid for this new species.

Type in my collection.

Hab.—Omit that Dr. Stanger collected the type.

Tonicia cuneata, Suter, 1908.

Thiele, to whom I sent a piece of the radula, has come to the conclusion that the species should be classed under *Spongiochiton* = *Loboplax* (*l.c.*, 72). See my remarks to the species on p. 43.

Lorica volvox, Reeve, 1847.

Thiele (*l.c.*, 88, pl. 9, f. 18–21) gives an amended description, and figures of intermediate valve, scale of girdle, spicule of same, and part of the radula.

Onithochiton marmoratus, Wissel, 1904.

Onithochiton marmoratus, Wissel, Zool. Jahrb. Syst., xx, 1904, 660, f. 67–69; Thiele, "Zoologica," xxii, Heft 56, 1910, 99, pl. 10, f. 64–67.

Thiele is quite correct that this species is the same as my *C. nodosus*. Wissel did neither mention nor figure the peculiar sculpture, but Thiele gives a very good figure of it. Wissel's name has priority.

The *type* is in the Naturhist. Museum, Bremen.

To those who have not access to Thiele's "System der Chitonen" in "Zoologica" it may be of interest to have a synopsis of it as far as New Zealand genera are concerned.

ORDO PLACOPHORA.

I. Subordo LEPIDOPLEURINA.
Genus *Lepidopleurus*, Risso.

II. Subordo CHITONINA.
1. Familia CALLOCHITONIDÆ.
b. Subfamilia CALLOCHITONINÆ.
Genus *Callochiton*, Gray.
Genus *Eudoxochiton*, Shuttleworth.
2. Familia MOPALIIDÆ.
Genus *Mopalia*, Gray.
Genus *Plaxiphora*, Gray.
Genus *Fremblya*, H. Adams.
3. Familia CRYPTOPLACIDÆ.
a. Subfamilia ACANTHOCHITINÆ.
Genus *Cryptoconchus*, Blainville.
Subgen. *Spongiochiton*, Cpr. (= *Loboplax*).
Genus *Acanthochites*, Risso.
4. Familia ISCHNOCHITONIDÆ.
b. Subfamilia ISCHNOCHITONINÆ.
Genus *Ischnochiton*, Gray.
Genus *Callistochiton*, Cpr.
Subgenus *Lorica*, H. and A. Adams.
5. Familia CHITONIDÆ.
a. Subfamilia CHITONINÆ.
Genus *Chiton*, Linné.
b. Subfamilia ACANTHOPLEURINÆ.
Genus *Acanthopleura*, Guilding.
Genus *Tonicia*, Gray.
Subgenus *Onithochiton*, Gray.

Cirsonella ? neozelanica, Murdoch, 1899.

In a very interesting paper, "Ueber einige Realiiden," in Archiv für Naturgeschichte, 75 Jahrg., vol. i, Heft 3, 1909, 387–90, Dr. Joh. Thiele states that, based on the radula, the genus *Omphalotropis* cannot be retained in the family *Realiidæ*, but has to be classed in the family *Pomatiasidæ*, subfamily *Omphalotropidinæ*.

The above-named species of Murdoch is shown to possess all the characters of the *Omphalotropidinæ*, and Thiele is of opinion that it may be nearest to some species of *Acmella*, Blanford, 1869, and he proposes to name it *Acmella neozelanica*, Murdoch.

The habitat of the species is interesting—around the margin of a brackish pool.

Drupa Bollonsi, Suter, 1906.

Iredale (P. Mal. S., ix, 75) gives it as his opinion that the shell described by me as new is the same as that figured in Mem. A.M., ii, 1889, pl. 4, f. 1–4, 7–12, 21, 22 (the figures are reversed), and named, but not described, by Brazier as *Purpura* (*Polytropa*) *Smithi*, from Lord Howe Island. I accept his view, and Brazier's name has priority. Iredale does not consider it a *Drupa*. For the present I see no reason why it should not be retained in that genus.

Gadinia nivea, Hutton, 1878.

Comparing typical New Zealand specimens with types of *G. conica*, Angas, and its synonyms, Iredale has come to the conclusion that our species is conspecific with *G. conica*, Angas. Hutton already stated in his M.N.Z.M., 202, that *G. nivea* may be the same as *G. conica*, Angas, for specimens received from Mr. Brazier show that it is not always so conical as represented by Mr. Angas.

Iredale (*l.c.*, 78) gives the following synonymy: *Gadinia conica*, Angas, P.Z.S., 1867, 115, 220, pl. 13, f. 27. *G. pentegoniostoma*, Sowerby: Angas, P.Z.S., 1867, 220. *G. conica*, Angas: Dall, Amer. Journ. Conch., 1871, vi. 11. *G. Angasii*, Dall, *l.c.* *Siphonaria albida*, Angas, P.Z.S., 1878, 314, 869, pl. 18, f. 14, 15. *Gadinia nivea*, Hutton, J. de Conch., xxvi, 1878, 36; M.N.Z.M., 37, 202: T.N.Z.I., xv, 1882 (1883), 144, f. S–V.

Hab.—Australia; New Zealand; Kermadec Islands.

Philobrya costata, Bernard, 1896.

Iredale (*l.c.*, 79) declares that *Philobrya Filholi*, Bernard, is the young of *P. costata*. The measurements given by Bernard for *P. Filholi* are evidently wrong, and they should read as follows: Diam. antero-posterior, 1·9 mm.; dorso-ventral, 2·0 mm. I consider the two species to be quite distinct.

Soletellina biradiata, Wood, 1815. Plate 62, fig. 13.

Solen biradiata, Wood, General Conch., 1815, 135, pl. 32, f. 1; Index Test., 1825, 15, No. 26, pl. 3, f. 26. *Soletellina biradiata*, Wood: Reeve, Conch. Icon., x, 1857, pl. 2, f. 7; Tate, T.R.S. S.Aust., ix, 87. *Hiatula biradiata*, Wood: Tryon, Am. Journ. Conch., iv, Suppl., 78. *Psammobia flavicans*, Lamarck, A.s.V., v, 1818, 514; Delessert, Recueil, v, 1841, f. 5; Menke, Moll. Nov. Holl., 184?, 41; Hanley, Cat. Rec. Shells, 1843, 57, pl. 11, f. 54; Philippi, Abbild. und Beschreib., i, 1845, 194, pl. 2, f. 4, 6. *Hiatula flavicans*, Lamk.: Bertin, Nouv. Arch. Mus., iii, 1880, 88. *Solen lividus*, Wood, Index Test., Suppl., 1828, 3, pl. 1, f. 3. *Soletellina nymphalis*, Reeve, Conch. Icon., x, 1857, pl. 1, f. 2. *S. epidermia*, Reeve, *t.c.*, pl. 1, f. 3. *S. Hedleyi*, Sowerby, P. Mal. S., vii, 1907, 302, pl. 25, f. 12.

Shell moderately large, elliptical, fairly solid, lightly angulated behind, light olive, concentrically finely plicated and striated. *Beaks*

small, contiguous, pointed. *Anterior side* slightly shorter, narrowly rounded, the dorsal margin gently sloping; *posterior end* tapering, slightly sinuated toward the basal margin, which is broadly convex. *Sculpture* consisting of concentric somewhat irregular plications and fine striæ, crossed by microscopic radial lines. *Epidermis* yellowish-brown, easily lost. *Colour* purple at the umbones, a few purplish-brown concentric bands, two whitish radial rays posteriorly, separated by a brown streak. *Interior* with a white callosity between the adductor-scars and at the posterior end. *Margins* sharp. *Hinge* rather short, with strong nymphs, right valve with 2 divergent cardinals, left valve with 2 cardinals, the anterior bifurcate, the posterior a raised lamella. *Ligament* strong and much raised. *Adductor-scars* unequal, the anterior narrowly elongate, the posterior roundish. *Pallial sinus* large, linguiform.

Length, 57 mm.; height, 35 mm.; diameter, 14 mm.

Hab.— One specimen was found in Manukau Harbour by Mr. Albert E. Brookes, Auckland. Australia and Tasmania.

Remarks.—The shell was kindly identified by Mr. Edgar A. Smith, I.S.O., of the British Museum, who also informed me that *S. incerta*, Reeve, is in his opinion most likely a Western Australian species, and the New Zealand habitat of the Conch. Icon. may be a mistake.

Trivia australis. *Page 302.*

Since writing the remarks on *Trivia zealandica*, T. W. Kirk, I have had an opportunity of seeing the type specimen, and found it to be a good species, distinct from *T. australis*.

Phalium labiatum, Perry. *Page 312.*

The specific name *labiatum* is preoccupied by Chemnitz, and Lamarck's name *achatinum* should be used (A.s.V., vii, 1822, 226; A.s.V., 2nd ed., x, 1844, 33).

Mitromorpha striata, Hutton. *Page 488.*

Having now examined a series of specimens, I have convinced myself that the species cannot be classed under *Mitromorpha*, but that its proper place is under *Daphnella*.

Euchelus baccatus, Menke, 1843.

Monodonta baccata, Menke, Moll. Nov. Holl., 1843, 14. *Euchelus baccatus*, Menke, Man. Conch. (1), xi, 1889, 435, pl. 62, f. 72, 73.

Shell globose conic, imperforate, solid, pinkish, with sparsely scattered reddish or blackish dots. Spire elevated, conical, constricted by deep canaliculate sutures; whorls 5, convex, encircled by closely beaded equal spirals, the interspaces lamellose-striate; spirals

(typically) 9 on the penultimate whorl, 17 on the last, including base. Body-whorl rounded, aperture rounded, lip thick, crenulate inside, columella concave, terminating in a minute tooth, and bounded by a longitudinal groove (Man. Conch.).

Height, 11 mm.; diameter, 9·5 mm.

Hab.—South and east Australia, Solomon Islands, Singapore.

Remarks.—In the collection of New Zealand shells in the Canterbury Museum I found two undetermined shells which were collected by Miss Robison at Cape Maria van Diemen about fifteen years back. On examination I found them to agree perfectly with the diagnosis and figures, and also with specimens in my collection. The shells are beach-worn, of a dirty-white colour, without any coloured dots. The penultimate whorl has 8 cinguli. The dimensions are—height, 10·5 mm.; diameter, 9·5 mm.; height of aperture, 5·5 mm.

This is a very interesting addition to the New Zealand fauna.

INDEX

TO

ORDERS, FAMILIES, GENERA, ETC.

[Names in italics are those of synonyms.]

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